Entered as second-class matter, April 14, 1899, at the Post Office at New York, New York, under the Act of March 3, 1879 (Sec. 415, P.L. & R.).

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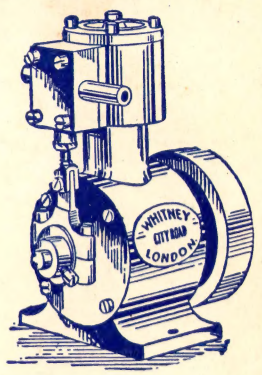

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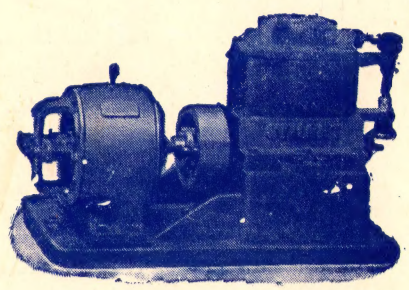

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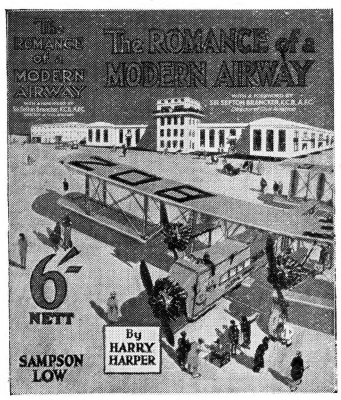

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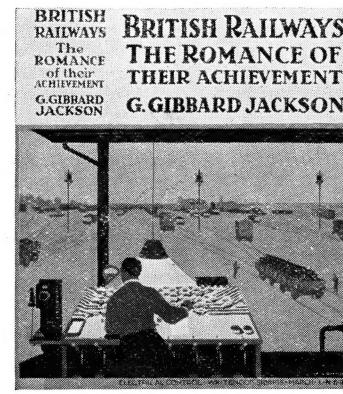

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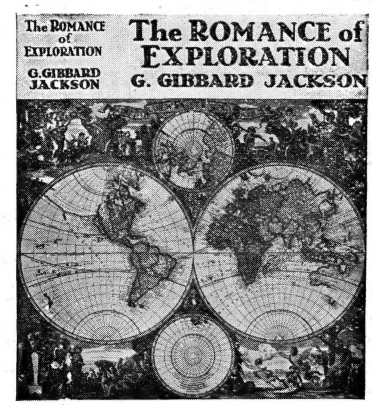

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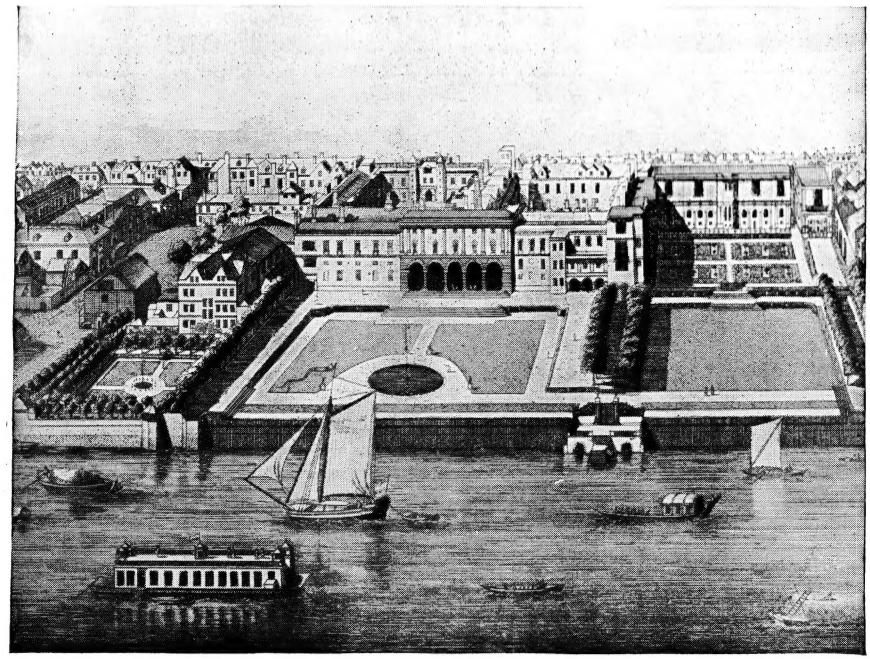

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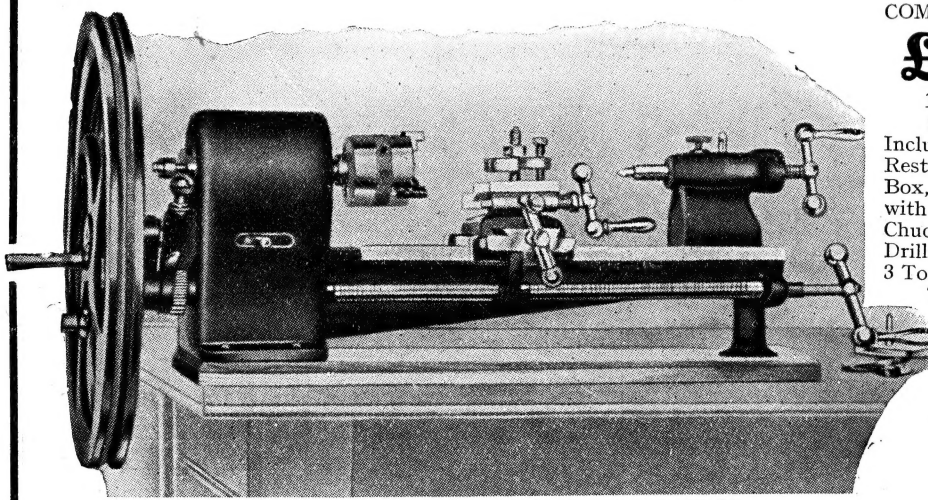

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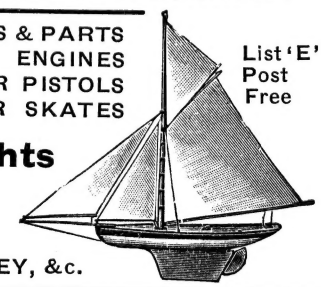

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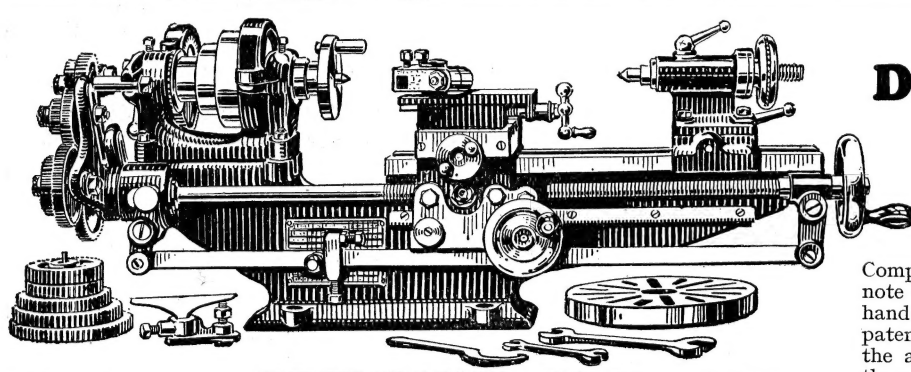

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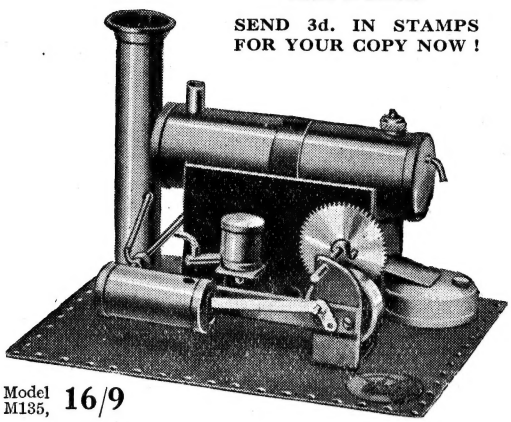

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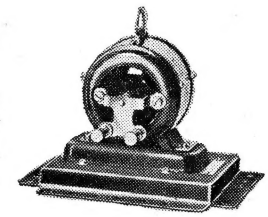

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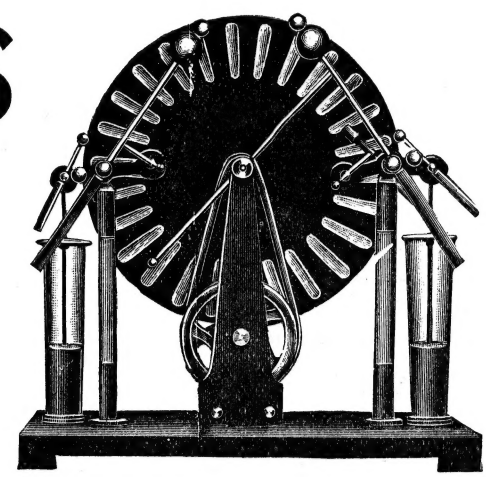

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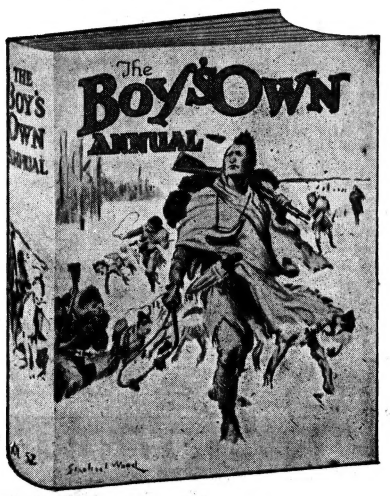

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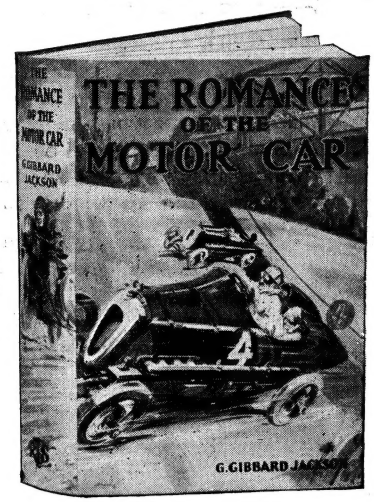

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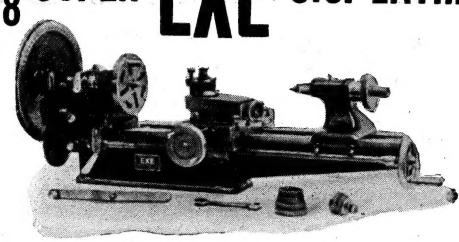

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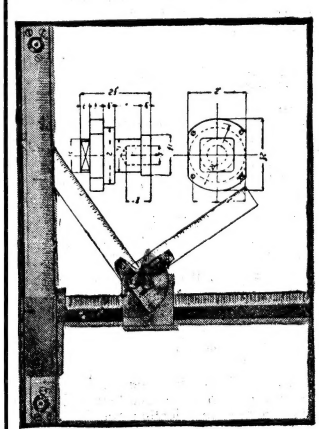

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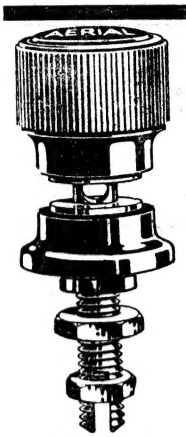

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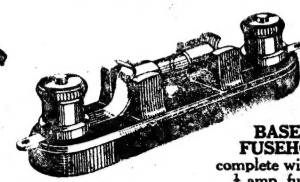

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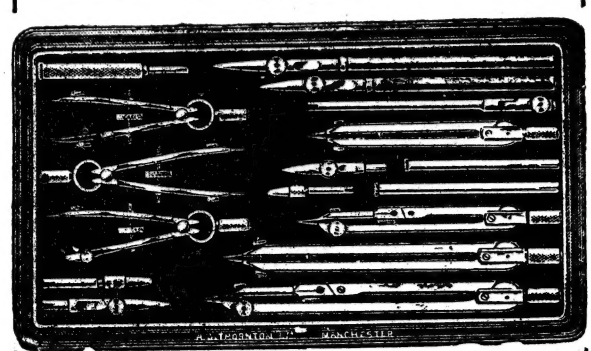

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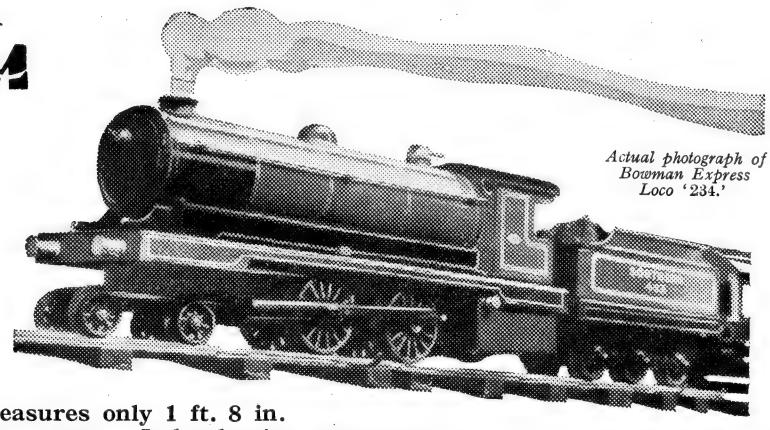

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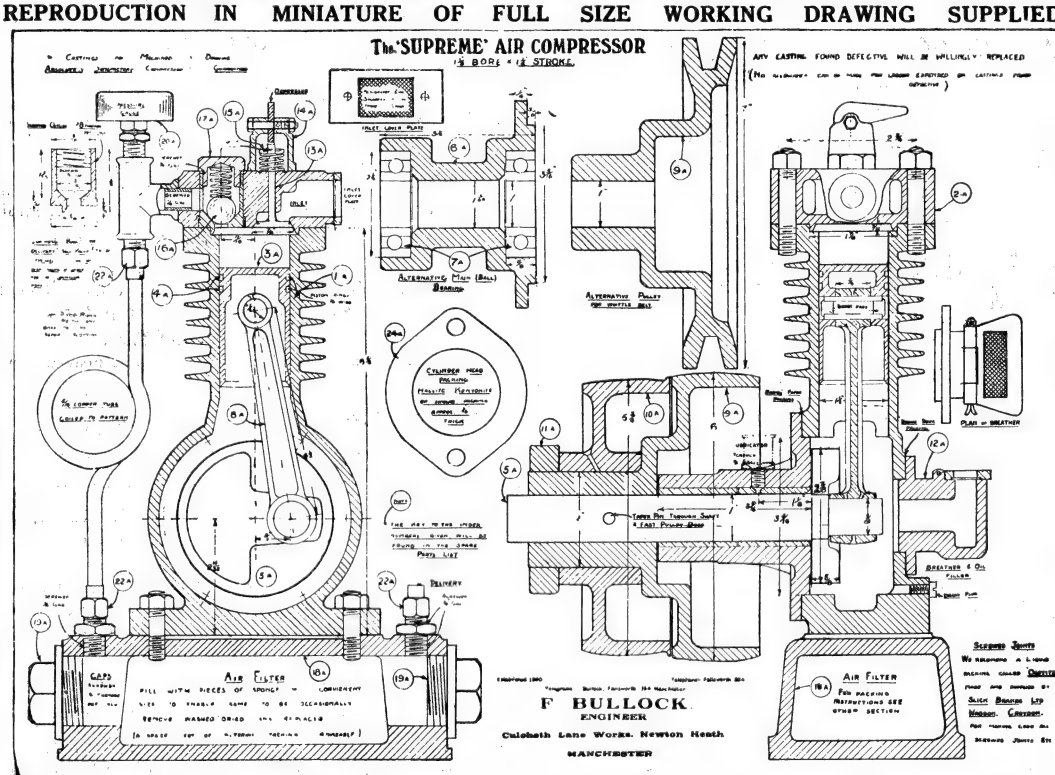

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MODEL ENGINEER
Edited by
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Editorial and Publishing Offices:
66 FARRINGDON STREET, LONDON E.C.4

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VOL. 63. NO. 1543. DECEMBER 4, 1930. PUBLISHED EVERY THURSDAY. 4d.

SMOKE RINGS

WE publish this week the first instalment of another article by Mr. H. J. Barton Chapple, covering an "all-mains" wireless receiving set he has designed specially for MODEL ENGINEER readers. I have watched with much interest the response from my readers to the designs for sets we have published during the past year, and I have been pleased to find that there has been a wide-spread appreciation of the good reception they have given. The various sets have been built by quite a number of readers, who have all been exceptionally pleased with the results obtained. The "all-mains" principle has come very much into favour with those who have a suitable electric supply available, and I felt that our service to our wireless readers would not be complete without a design of this character. Mr. Barton Chapple has taken a great interest in his latest MODEL ENGINEER production, and tells me that he is thoroughly satisfied with the results obtained from the experimental set he has built. It is naturally of a more elaborate character than the battery-power sets, but in view of the simplicity and convenience of operation of an "all-mains" set, the extra initial cost is fully justified. Those who study the design will realise that there is plenty of scope in the set for the model engineer to use his tools and constructive abilities.

* * *

THE exhibition of "Period" models at Dudley House which we dealt with in detail last week may have set some of my readers thinking about kinds of model-making a little off the beaten track. One advantage of the modelling of historical ships, of furniture, of vehicles, and similar prototypes is that the work can be done with comparatively simple tools, and in a very limited workshop space. I have been surprised, in looking through the entry forms for the competitions at our own Exhibitions, at the number of models which have been made "on the corner of a kitchen table," or at the drawing-room fireside. Obviously, many of the models at the Dudley House Exhibition could have been made in the same restricted circumstances, and probably many of them were. Readers of THE MODEL ENGINEER often tell me that they are tremendously interested in models, but have never made one for lack of workshop accommodation. If they want to build an inch-scale locomotive or a marine engine or petrol motor, their excuse is no doubt well-founded, but there are really plenty of things worth modelling which can be tackled in a very modest way. I am so convinced that many more people can be started on model-making with simple materials that I am preparing a little surprise scheme for our next Exhibition. This will be announced in our issue of January 1 next, and the presentation plate with that issue will form part of the scheme. I think it will interest you, but you must possess your souls in patience till the date of disclosure arrives.

* * *

WILL indoor flying of model aeroplanes displace midget golf as a popular craze? I do not think the golf craze will last very long in this country, but I can see great possibilities for indoor flying meetings and competitions. The Model Aircraft Club have followed up a suggestion I put forward a year or so ago, and have this season held several very successful evening meetings at the Royal Horticultural Hall. The photograph I reproduce, taken at one of these meetings, shows the gathering of real enthusiasts who have rallied round. I well remember the sensation caused many years ago when Mr. E. W. Twining flew a model aeroplane in the room at one of the meetings of the Society of Model and Experimental Engineers in London. This was shortly after the Wright Brothers had astonished the world by their successful flights, and Mr. Twining produced a model biplane on some-

An Indoor Flying Meeting at the Royal Horticultural Hall, organised by The Model Aircraft Club.

what similar lines to the Wright machine, which put up quite a satisfactory performance. Model aviation has advanced very much since those days, and many highly successful outdoor meetings have been held. Indoor flying has the great advantage of being immune from bad weather conditions, and though the still atmosphere of the hall possibly detracts in some measure from the realism of the miniature 'plane battling against winds and air-currents, very interesting and attractive flying can be done. The organisers of these meetings must necessarily acquire experience gradually, as to the most suitable types of machines to use, and the most suitable events to hold. But there is no doubt about the interest of these indoor gatherings, and I anticipate that they will grow in popularity, not only in London, but in other centres of model aviation interest also.

* * *

LAST week I had the privilege of co-operating with Mr. L. G. M. Ferreira in judging a group of models made by members of the Society of Model and Experimental Engineers in competition for the "Mary Anne Barker" Memorial prizes value £25. The work on view formed a striking testimony to the high degree of mechanical skill to be found amongst the members of the Society, for although some pieces of work were naturally better than others, there was not a single poor example in the group. The craftsmanship was all good, and some of it was very good. The first prize was awarded to Mr. H. Hildersley for a partly finished model of a 12-in. howitzer which aroused general admiration by the particularly clever work put into the breech-block mechanism, and into the rifling of the gun. One of the conditions of the competition was that credit would be given for any special patterns, tools or fixtures made by the competitor for his particular job, and Mr. Hildersley scored some good marks for the ingenious and well-made tools used for the boring and rifling of the barrel. The second prize went to Mr. C. S. Barrett for a well-made working model of a hydraulic press. This was certainly something out of the beaten track, and resulted in a model very pleasing to the engineering eye; the drawings and patterns for the press were included in the exhibit. A model electrically-driven yacht secured the third prize, this being the work of Mr. H. E. Sandy. A very successful hull had been constructed by the brown-paper method, and all the deck fittings and details of the boat were exceptionally neat and well proportioned. Several other competitors ran the prize winners very close, notably Mr. C. J. Groom with a gear-cutting equipment, Mr. F. E. Rayner with a locomotive boiler, and Mr. T. N. Gilbert with a group of workshop tools and gadgets. It was very pleasing to me to examine such a nice show of work.

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Better and Better.

SOME years ago I gave a picture of Mr. Dick Gowlland's 4—6—2 which hauled a four-passenger load on 2½-in. gauge at the Caxton Hall, and thought at the time that when a brother who built record-breaking power boats turned his attention to locomotive work we should eventually see something either startling or "out of the common" in that sphere of activities also. Well, I guess time proves all things, and so it is in this case, for here you see our worthy ex-power-boat wallah at the throttle of his latest achievement, the first 2½-in. gauge steam Garratt locomotive to take the road in U.K. She was "shot" on the Carshalton L.R. by the genial and enthusiastic owner of that road. I should have been present at the run, but to my great regret, up to the present time, Fate has block-sectioned every opportunity I have so far had of giving her a personal test. Still, we live in hopes, and maybe I'll be able to get a few close-ups and details of her. The wheel arrangement is "double Atlantic"—4—4—2 + 2—4—4—and she has, as can be seen from the photo, the usual Garratt boiler with outsize firebox and other characteristic features. More anon.

Photo by] **Easy Work for the "Garratt."** [*C. J. Grose.*

Cast Steel or Malleable Iron?

I see old friend Fraser is trying to have a dig at me on page 483, November 13 issue (did somebody say what an unlucky date), but anyway, I'll be very glad to reply, for I do like to have a friendly word with somebody who knows what he is talking about. As a matter of fact, it doesn't matter a bean whether you use cast steel or malleable iron for the frames of a "Timkenette." If I needed any I'd be glad to take whatever the founder thought would come out best, and maybe should have mentioned it in the notes. However, small *soft* steel castings *can* be made. I don't know whether the "mild steel castings" of gas engine crankshafts put on the market years ago by a Northern firm were really mild steel or malleable iron, as I never inspected one at close quarters; but I knew several folk who made up the engines and they said that there was no trouble in machining. Maybe, Mr. Fraser can give information as to what the metal really was. But I *have* had small steel castings, and machined them up on a pedal lathe. Really and truly! Some years ago—directly after the war, as a matter of fact, when all things were scarce and dear—I wanted some 2¾-in. driving wheels pretty badly, of a special pattern. I had one sample, but couldn't match it anywhere. A friend who had been on munition work said he could get some cast for me in steel, if that would do. I said, sure it would, if they could be machined easily, without chewing up all my tools, at which he assured me they would be as soft as ordinary drawn or cold-rolled rod. He was perfectly correct, they machined up exactly the same as mild steel, the turnings coming off in the familiar long curls, and leaving the same silvery-like turned finish. I bent and finally broke a spare one across, and the fracture was correct. I cannot recall at the moment the name of the place where they came from, but will get it if possible, and put it in these notes.

One night "after hours" I was tinkering about in Mr. Holt's shop at Greenwich, Conn., experimenting with an automatic coupler, 3½-in.

gauge size, to make it self-opening as soon as the locking pin was lifted, and so doing away with a separate knuckle-thrower. The little coupler was clean cast, easily filed, drilled, and tapped; I bent the stem accidentally whilst in the vice, and it went back again without the least trouble. I don't know whether the coupler was steel or malleable iron, never troubled to examine its constitution so closely; but the local firm who cast it at Stamford, Conn., could easily have turned out "Timkenette" frames by the bushel in the same metal, which would have done the trick O.K. But I'm going to get one shot home on friend Fraser. I'm open to bet he couldn't chaw a pair of "Timkenette" frames out of the solid whilst I was building one up out of bar. Not unless he has been taking lessons from Mr. Carnera and developed his biceps some! Regarding the name, call the locomotive what you like, it would still smell as sweet (especially if burning fuel oil in a spray burner—shades of grilled kippers and toasted cheese!), but I distinctly remember putting down that I didn't believe you could get real "Timken" bearings suitable for 3½-in. gauge axleboxes, and balls might be used instead to preserve the easy-rolling characteristics—this surely would not alter the "copyright" of the "Timken" design. By all means use little "Timkens" if obtainable; but don't *make* them, or you'll have friend Fraser wanting you to call it a "Brownette," or "Jonesette," or "Robinsonette," "by the same token," as Paddy says. However, joking apart, our worthy friend shows true enthusiasm in his concluding sentences, and I'd be only too glad to keep him company on a trip to see a "Timkenette" in action.

One or two correspondents are of opinion that I have over-estimated the probable tractive effort of a 3½-in. gauge "Timkenette." I just haven't —*under-estimated* it would be more likely. Needless to say, I didn't calculate by formula—the sight of a mass of figures and letters always gives me a pain. Look at the nobby collection, for example, on the same page as Mr. Fraser's letter; why, bless my soul, there are more "D.T.'s" in it than you could collect in a New York "speakeasy"! My estimate was based on *actual performance* of 3½-in. gauge American locomotives, one of which started a dead load of 1,992 lbs. on a rising gradient of 1 in 75, with 70 lbs. steam. "Calculated" or "formulated" results take no heed of the "things that matter," viz., workmanship, valve timing, the human element, etc. I'm still awaiting the figure-merchants' explanation as to how it comes about that out of a total of, say, fifty locomotives built to the *same* design, in the *same* shops, from similar materials, *no two will ever put up absolutely identical performances.*

Let's Have a "Little Rainhill."

Talking about performances, how does the following strike you as a change from the usual competitions at The Model Engineer Exhibitions. There is plenty of time between now and next September for anybody who puts his back into it to complete a "Dairymaid" engine, and even a slow worker could get sufficiently far advanced to be able to run on the track. Well, supposing I offer a reward of, say, two guineas to the builder of the "Dairymaid" engine, finished or unfinished, which puts up the best performance on the track at the next Exhibition. Winner to have highest aggregate of points for (*a*) length of run on one firing, (*b*) length of run on one charge of water (all engines being equally loaded), and (*c*) maximum load shifted from dead standstill and hauled twice up and down track without losing pressure. Judging to be done by a committee of three independent working engine-drivers not connected with the S.M.E.E. nor any journal whatever.

Whilst pottering about among the crowd at the last Show I heard plenty of comments as to the uselessness of entering average work against the "glamour of paint and polish," despite our worthy Super's exhortations to all and sundry. Well, providing all are agreeable, here is a chance. Paint and polish counts for "pussy" in this jamboree—they never helped us to keep time with a heavy train in bad weather with Niagara Falls coming over the top of the brick arch on to a fire of best dum-dum. Now, what about it? Any comments, glad of 'em.

Please Don't Be Impatient.

It is surely a hard job to please all, and I can but try. If those brothers who are waiting to get on with the L.M.S. 4—6—0 will only hang on a wee bit longer, I'm getting out the general arrangement with a few details on it, same as I did for the simpler one now running. Will publish as soon as possible. In answer to those who want to rearrange the "Dairymaid" and use outside cylinders, this can be done very easily, especially if you want the L.M.S. "compound" type with inside valve gear. Use Averill type cylinders (Kennion can supply castings) and the Stephenson link motion as described for shunter. I have given instructions how to build my old "Ayesha" in a contemporary journal, and the same cylinders and motion can be used by shortening the connecting and eccentric-rods. But apart from the Southern Railway "School" (V) class, which are the best balanced 4—4—0's now running, I'm not keen on outside cylinder 4—4—0's. They usually shoulder badly at starting, and are more or less rough riders. Although less accessible, the inside type same as the "Dairymaid," are preferable for appearance and performance. Friend Stewart, of New Zealand, expressed the same opinion when a big "Dairymaid" flew past the bottom of our garden at a good seventy, whilst he and Mr. Kirk were at my home on a friendly visit. Well, so much for pros. and cons.; now let us pick up the tools again.

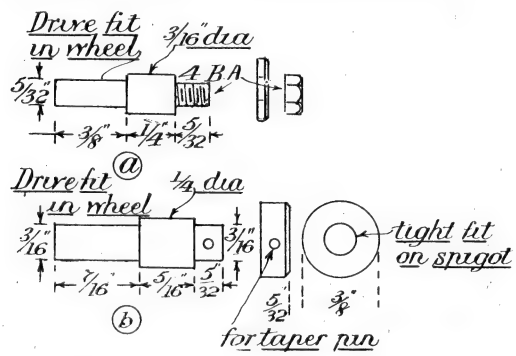
Crankpins and Coupling Rods ("Dairymaid").

The crankpins are a plain turning job needing no detailed explanation, and are shown in the sketch. All four are alike, as there are no outside connecting-rods to pass close and foul them. If you have a collet chuck, make them from bright ground steel the diameter of the working part of the pin. If not, use ordinary mild steel a little larger than finished diameter, and turn the part which goes into the wheel boss and the journal at the same setting. Simply part off and reverse to shoulder for screw thread; if the screwed part is not quite concentric with the journal it does not matter.

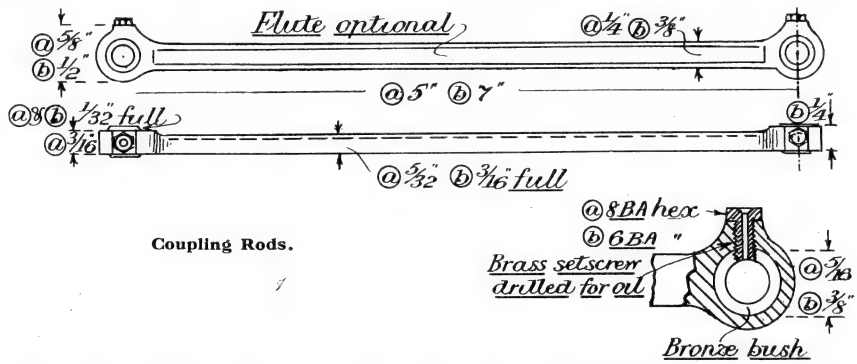
Coupling-rod making is dreaded by many, and I don't wonder at it, in view of the fact that many good folk will take a piece of mild steel bar and keep on filing and filing away until they have reduced to powder a larger quantity of

steel than what is left to form the rod. No need for this at all; a file need only be used for small reductions and to finish off, even when no methods of machining are available. Our tried, trusted and much-abused friend the hacksaw will do all the donkey work with a little wangling. Mark off on a piece of flat mild steel bar, the outline of the rod, and drill a No. 32 hole at the journal locations; cut a similar piece of bar, drill it by using the the first piece as jig, and drive in at each end a piece of $\frac{1}{8}$-in. steel to keep the two rods lined up until finished. This is better than riveting together in the ordinary way, as there are no projecting heads to catch the vice jaws, and the pins are easily knocked out. Anybody who owns or has access to a milling machine (far more useful tool than planer or shaper), put a small facing cutter, say, 1 in. diameter and $\frac{5}{8}$ in. long, on the arbor and go right ahead *using plenty of lubricant.* It is a good wheeze to hang a little can on the overhead arm, with a 3/16th-in. cock and pipe in it, which will allow a steady flow on to the cutter; the surplus can be caught in an old fruit can or something similar placed under the drain hole on table or tray, and returned to the feed can. Mill along top, bottom and both sides; the use of the small diameter cutter does away with the need for filing the inner curve of the bosses. The flutes are put in with a $\frac{1}{8}$-in. or 3/16th-in. slotting cutter, and the ends finally finished off by filing to outline. The two rods are then parted, and the holes opened out and bushed as sketch. Use red phosphor bronze for bushes. The one on driving wheel end has to be a nice working fit on the pin, but that on the trailing wheel has to be quite easy and may be given a little play, otherwise there will be trouble when the engine runs through crossing frogs or over rough road. The big "Dairymaids" have 1/16th-in. slop in the trailing bushes when new, and that is why the rods "ring" when drifting with steam off.

If you have to make your rods by hand, clamp in the vice with the marked line just below top of jaws. At one end, right for preference, file a gap large enough to take a hacksaw blade on its



Coupling Rod Pins (use either pattern as desired).



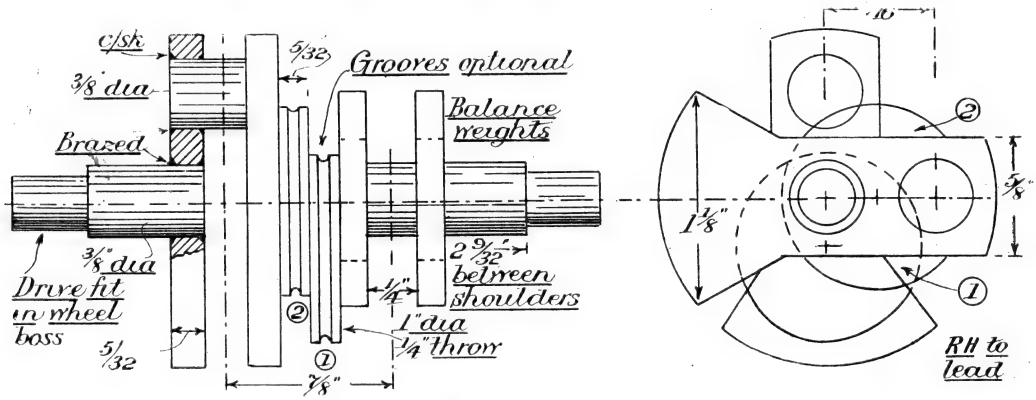
Coupling Rods.

side. Put a coarse-tooth saw in the frame thus, and saw along, lubricating the blade with cutting oil (or soapy water, at a pinch) and keeping it pressed flat on the vice top. When you get to the end of jaws shift rod along and carry on again same way until you get within 3/16th in. or so of the boss at the other end, when you can either file down with a round file to meet the sawcut or saw down and round off with file after. Repeat on bottom, and finish with file. The recess at sides may be filed as only a little has to come off. The flutes may be left out, but if you are tickled with a fluted rod's appearance put a $\frac{1}{8}$-in. or 3/16th-in. slot-drill in three-jaw chuck, set up the rod in the tool-post with the centre of it level with lathe centres, clamp tightly down (the Willis type holder is best for this) and traverse across the cutter with the cross-slide, feeding into cut with the top-slide, while the lathe is running at a high speed. Once again—don't forget to lubricate. Cutting oil isn't half as dear as spoilt work and blunted and damaged cutters, to say nothing of extra expenditure of "watts" by a human lathe motor!

Crank Axle ("Dairymaid").

Both sizes of engines may use a built-up crank axle. It is a dickens of a job to chew a crank axle out of the solid with a pedal lathe, and a properly brazed one is just as good—anyway, I find it so. As you see in the sketches, we use the balanced type as fitted to all modern inside-cylinder engines, the webs or cheeks being cut from 5/32nd-in. flat mild steel in the case of the $2\frac{1}{2}$-in. gauge engine. This is thinner material than the so-called "standard" cranks, but it is plenty strong enough; in any case we could not use heavier section steel as we are adopting long driving axle bearings and are monopolising the entire space between them. Leave the webs over length, and when the shaft is finished it can be put in the lathe, and both ends of the webs turned truly, which will assist balance. Mark off the location of axle and crankpin holes on one web, drill it $\frac{1}{8}$ in. and use as a jig to drill the rest; then open out all the holes with a 23/64th-in. drill, finally ream *in pairs* with a $\frac{3}{8}$-in. parallel reamer well lubricated. Countersink all holes both sides.

Turn up both main axles to same dimensions whilst on the job. If your chuck is reasonably true, cut off two lengths of bright ground mild steel and mark off position of wheel seats. Chuck and turn with knife tool as described for bogie wheels. If your chuck isn't good enough, turn the axle from a larger size of ordinary mild steel run between centres in usual way. Drive



Crank Axle. (2½-in. gauge engine only).

on one pair of webs, and put in the crankpin, which is a piece of above-mentioned ground steel. You must next decide what valve gear you are going to use. I mentioned at first that I would include Stephenson link motion in the description, but find that four eccentrics between the cranks is cutting things a bit too fine for a beginner, so there remains Joy's (the genuine article, not the grasshopper variation), Walschaerts, or loose eccentric. In the case of the first, no eccentrics will be needed at all, unless you care to use an eccentric-driven pump in place of the crosshead pump which I shall give notes on making; in which case fit a single eccentric for ⅜-in. stroke in the centre between webs. For Walschaerts gear two eccentrics will be needed, 5/32nd in. wide, set with their centres 90 degrees in advance of the cranks. If loose eccentrics are desired beginners had best leave the axle clear and fit split sheaves after all is brazed up, otherwise when the brazing job has cooled off it is quite possible that the eccentrics will be very far from loose! Anyway, drive on the pump or Walschaerts sheaves, whichever you will use; follow up with the other pair of webs and crankpin, then set all correct by means of square and scribing-block. Lay the crank on a pair of vee-blocks (journals in the vees), the blocks resting on the lathe bed, drill-press table or other flat surface. Set one crank up straight by lining up crankpin and axle to the blade of the try-square, whilst the stock is pressed down on the flat surface. Then set scribing-block needle to the centre of the axle and shift it along till it tallies with the middle of the other crankpin. If it doesn't tally first shot, then shift the crank around the axle a little till it does. If a line is scribed through the thickest part of the eccentric sheaves before they are put on the axle they can be set at right angles to the cranks by making the lines tally with the scriber point whilst the corresponding crank is located by the square as above.

Brazing is simplicity itself. Wind a couple of coils of brass wire around each joint, either side of webs; cover them with Boron paste, place in your brazing pan among the coke, and give the whole issue "gyp" with the blowpipe, lamp or torch until bright yellow, when you will find the brass wire has disappeared into the joints and she's all solid. Quench out in *water only* (not acid) and clean up. Final finish and fitting next week, with details of eccentrics and sketch of 3½-in. crank axle.

For the Bookshelf.

Essays of a Locomotive Man. By E. A. Phillipson. London: The Locomotive Publishing Co., Ltd. Price 3s. 6d., postage 4d.

This unusual contribution to the literature of the locomotive contains thirty-five essays on a wide range of subjects. The author, in his Prepare, puts them forward as an attempt to sum up the arguments which take place when two or three locomotive men get together and talk "shop." This explains the diversity of the subjects touched upon, and also why some subjects are introduced, which, while of much interest, do not usually figure in a more technical locomotive manual. A few of the titles of the essays are: Footplate Arrangements, Running Shed Equipment, Engine Failures, Training of the Locomotive Engineer, Light Railways, The Rivals of the Steam Locomotive, New Engine Performance Reports, and the lay-out of Locomotive Running Sheds. The essays are excellent reading, and while stimulating to the real locomotive man who thinks about his job, are very informative for the amateur who takes more than a passing interest in the technical points involved in locomotive construction and performance.

The Boy Electrician. By Alfred P. Morgan. Fourth Edition, revised by J. W. Sims, M.I.E.E., A.M.I.Mech.E. London: Geo. G. Harrap & Co., Ltd. Price 7s. 6d., postage 4d.

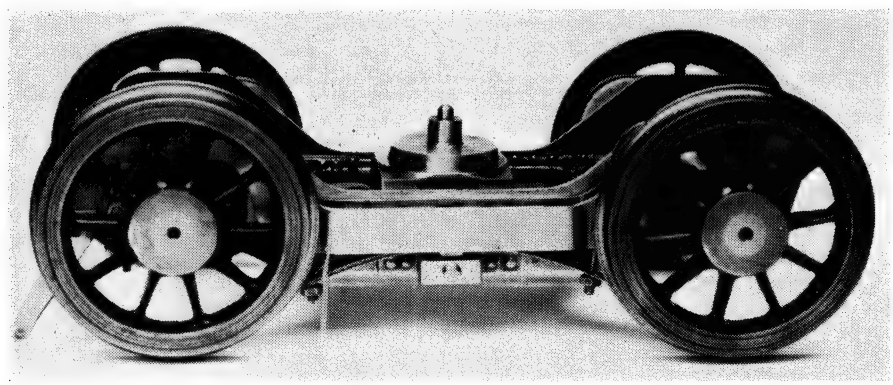
For the young experimenter with a leaning towards electrical science it would be difficult to find a more fascinating and instructive book. It it packed with illustrated descriptions of how to make electrical apparatus of many kinds in the most inexpensive way. It is quite up to date, and now includes some account of how electrical apparatus has developed in industry, transport, medicine, horticulture, and, of course, in the home. The problems which invariably face the young electrician in his early days are discussed and solved in a practical fashion which cannot but be helpful to every young experimenter.

A ¾-in. Scale Locomotive Bogie.

By Harold V. Steele.

THE model bogie now described was required for a ¾-in. scale Southern Railway "King Arthur" class locomotive, the work on which is fairly well advanced, and it was decided to employ the same principles as obtain in the prototype, with as many of the details to correct scale size as would be practicable for construction by an amateur.

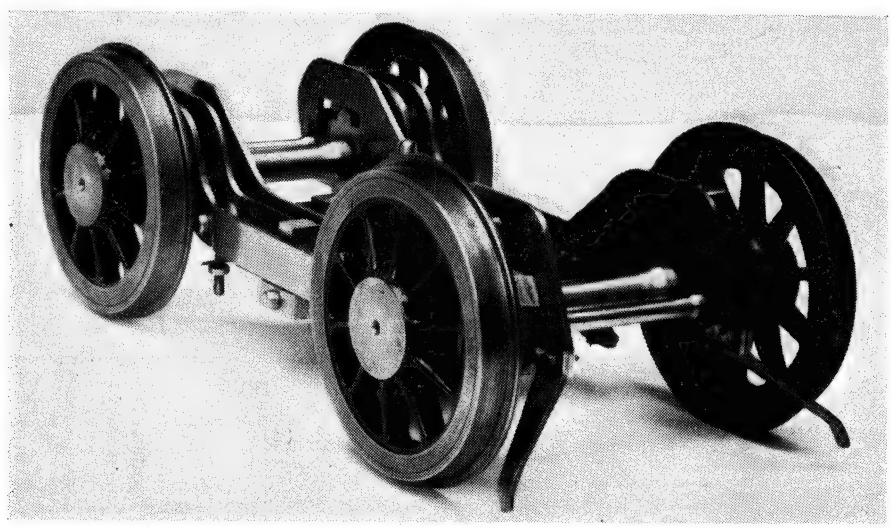
The axles were made from ½-in. mild steel, cut, centred, and faced to dead length. The extremities were turned to a "thou." and a half over 7/16th in., and the journals reduced to 13/32nd in. diameter, with a radius down to ⅜ in. for the centre portion of the axle.



3/4-in. Scale Locomotive Bogie (Side View).

The wheels are Bassett-Lowke's castings, in iron, and are 2 11/16th ins. in diameter. These were held, back outwards, in a three-jaw chuck, centred with a Slocombe, drilled, bored, and finished with a 7/16th-in. reamer. The axles, of which the extremities, as previously mentioned, had been turned a little over size and slightly rounded at the extreme ends, were allowed to just enter the wheel centre, and with the aid of oil smeared on both surfaces, were pressed on to the axle in a heavy parallel vice. It was thus possible for the remainder of the wheel turning to be done between axle centres. The tyres were finished with a spring former tool, the property of Mr. H. G. Eckert, of the London S.M.E.E.

The axleboxes are fitted with keeps, the first process, after milling the flanges, being the fitting of a solid keep into a recess milled into the box up to the longitudinal centre line. The keep pin, when inserted, held both portions in position. The boxes were then bored, but finished with a reamer when in position in the horns. Lastly, the flanged spigots which engage in the equaliser bearers were pinned to the top of the boxes, and oil holes drilled.



3/4-in. Scale Locomotive Bogie. The apparent excessive off-set of the near side guard-iron is a photographic effect.

The main frames were sawn from 1/16th-in. bright flat steel. The eight horn cheeks were

made from angle steel with ribs brazed in and were riveted to the frames with steel packing pieces between to permit the boxes to slide. Steel rivets were employed throughout the job. The popular copper rivet was not utilised. Two stretcher rods were turned from mild steel, shouldered the correct distance between frames, threaded and provided with nuts.

The steel equaliser spring brackets were filed and slotted to shape, riveted to the frames, and drilled for the gudgeon pins, which are of mild steel, provided with washers and split pins.

The guard irons were filed out of bright flat steel, the angle to which they were bent having been previously determined from a temporary thin brass template. Observations made upon several engines of this class at Victoria Station disclosed that the guard irons were bolted inside the bogie frames. On the drawings they are shown fixed to the outside of the frames, and were so placed in the model.

The bogie stretcher casting in the actual engine is complicated indeed, and the numerous ribs are mostly I-section. In addition, the slots for the side control springs are cast in. To have reproduced this casting correctly would have involved some difficult pattern-making, so in the model the design was simplified, although the outline, with as many of the ribs and beadings as possible, was retained. The casting was made in gunmetal by Mr. Kennion and the sides shaped and the slots milled in the Society's workshop. Steel strips on which the table slides were screwed to the top of the casting.

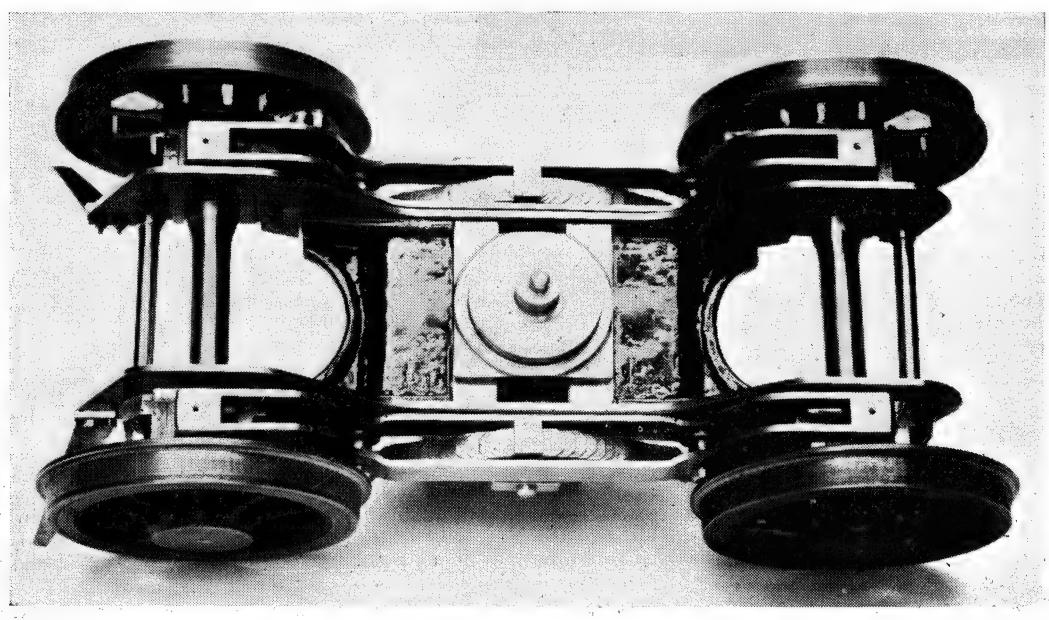
At this point adventure overtook the job. On the way to the workshop the case containing stretcher casting, side frames, slide and depth gauges, drills, and other small tools was left in a L.C.C. tramcar, but was recovered intact at the Lost Property Office, Lambeth, a few days later.

The four equaliser cradle sides were sawn and filed from flat steel simultaneously, and it was necessary for them to be joggled to clear the laminated spring buckles. A simple press die was made for this purpose, consisting of two lengths of thick strip steel, with thinner strips screwed to the top edges to form an angle and to permit them to rest on the jaws of the vice. Suitable pieces of steel were riveted to the faces, the equaliser blanks made red hot and placed between the dies. When the vice was screwed up it pressed a neat joggle in the plate. Two or three heatings were necessary, but there was no difficulty in regard to the bend being made in the correct place, as the dies, being free to float on the vice jaws, adapted themselves to the partially pressed blank at each heating. The horn stays were pressed with a smaller but similar die.

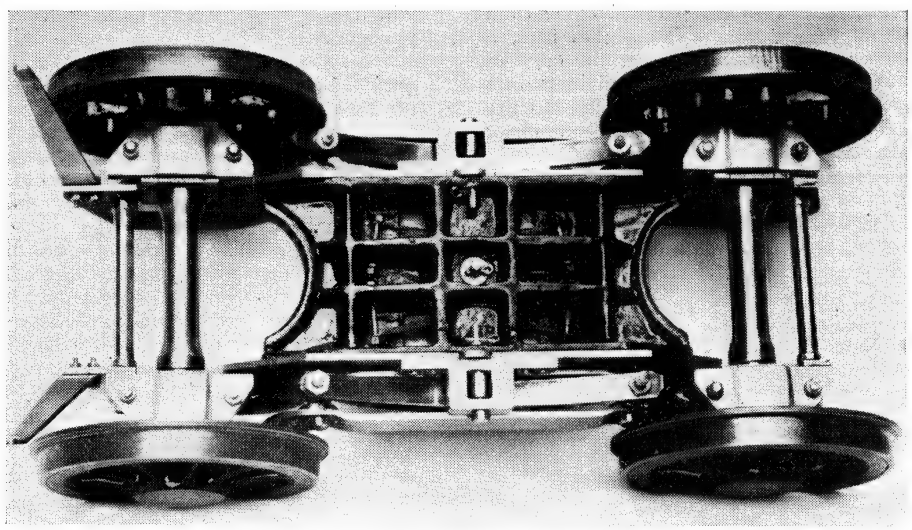
The two laminated equaliser springs were made from $\frac{1}{4}$-in. by 1/32nd-in. spring steel, obtained from Smith & Sons, Clerkenwell Square, and each contains 16 plates. The strip was held in the vice, and the varying lengths were cut off with a cold chisel. The plates were then softened, and the camber obtained by tapping over a convex hardwood block. This did not appear to affect their resilience. The spring buckles were filed out of steel, and were made with eyes at the bottom, through which the gudgeon pins secure them to the main frames. Two smaller laminated springs, 3/32nd in. by 1/64th in., for the side control, were then made, and these, with the six 5/16th-in. by 1/32nd-in. on the engine, completed the set of ten. Each has the correct number of plates, and the making of so many laminated springs became wearisome.

At this stage the bogie, which had been entered for the Sir Edward Nicholl Competition of the S.M.E.E., was duly exhibited, although unfinished, as there still remained to complete the table and trunnion and the fixing of the side control springs.

The bogie centre table is a rectangular piece of gunmetal, riding on the steel facings of the bogie casting. Riveted underneath is a block, constrained in a transverse slot in the casting,



3/4-in. Scale Bogie. View showing Joggled Equalisers.



3/4-in. Scale Bogie. Underneath view showing side control springs in centre casting.

the ends engaging the side control spring buckles. The top was recessed and chamferred to take the engine bogie centre or trunnion. This is a steel disc with a spigot above and below. The top spigot will be riveted to the engine, and the lower one passes through the table and casting, the whole being secured by a long bolt with a washer and split-pin.

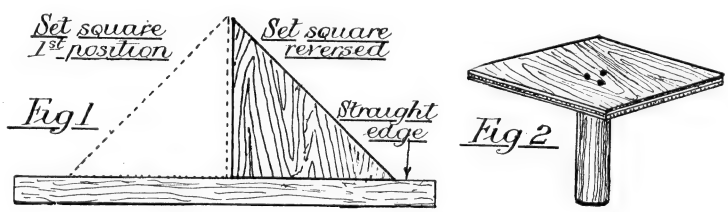
Acknowledgment must be made to Mr. R. D. Steele for much information in regard to details of design, and to Mr. J. N. Maskelyne, of the S.M.E.E., for the photographs.

Plywood in the Model Engineer's Workshop.

By J. V.

MODERN plywood is an admirable and dependable product, and waste ends and offcuts, which can be picked up for a copper or so at any joiners' shop, will prove extremely useful in many a model-maker's workshop.

Excellent set-squares can be made by carefully trimming up the edges of triangular pieces of plywood with a finely-set plane, afterwards testing for squareness by the method shown in Fig. 1. A straight-edge is laid on a flat surface, such as a drawing-board, or another sheet of ply. One edge of the square is held firmly against the straight-edge, while a fine line is scribed along the other edge. Then, without disturbing the straight-edge, the square is turned over, the edge brought close up to the line again and another fine line scribed. If the square (?) is true, the two lines will be parallel, if not, then the divergence of the two lines shows *double* the error of the square.



Two Examples of the Use of Plywood.

A large square, say, 3 ft. by 2 ft., is sometimes very handy, and can be made in the same way, but in this case it is advisable to stiffen up the sheet with battens nailed on all round but set back $\frac{1}{4}$ in. from the edges.

A first-class drawing-board consists of a board of soft pine or Gaboon mahogany plywood about $\frac{1}{2}$ in. thick. The edge against which the tee-square works can be "shot" true with a trying plane, but preferably should be faced with a strip of hard mahogany or ebony. Battens can be screwed underneath, if desired, to raise the board and enable the stock of the tee-square to comfortably clear the table.

Every draughtsman knows how easily broken are the ordinary thin pearwood French curves. Curves cut from thin plywood will stand a lot of knocking about, and can be cut with a fret-saw and cleaned up with fine files, or even a piece of sandpaper wrapped round a stick.

Templates and patterns for sheet-metal work can be cut out in the same way, holes are bored with a centre-bit held in a brace, which will be found to leave clean-cut round holes.

Small tool and material trays are made by nailing thin wood strips to a plywood bottom. The writer has in mind a miniature chest of drawers made some years ago to contain clockmaker's tools and materials, which was made almost entirely of waste pieces of plywood. The drawers are fitted with tiny turned wooden knobs, and have type-written labels attached showing the contents of each drawer.

Users of worm dividing attachments for cutting toothed wheels, etc., will find division plates

much more durable if made from plywood than if made from the usual cardboard; in fact, a disc of ply about 12 ins. diameter, the edge of which is carefully divided up with dividers into 60 parts, will be found accurate enough to use as a division-plate when cutting small clock wheels, etc.

When the modeller has occasion to use plastic materials, such as mastic cement, putty, white-lead, etc., he will find that a small "hawk" or handboard, made as shown in Fig. 2, with a piece of ply nailed to a short piece of broom-handle, is very light and convenient, while if the surface of the plywood is given a coat of paint or varnish, the same handboard can be used for plaster, mortar, cement or other wet materials, which, of course, would soon destroy untreated plywood.

Strong plane and saw handles, capable of withstanding much rough usage are made by gluing together several pieces of plywood to make up the desired thickness, cutting out to shape with a bow or keyhole saw, and trimming up with a file and sandpaper. A coat or two of shellac varnish will prevent the handles from becoming grimy with use.

Many other uses for this, for the most part, waste material will suggest themselves to the ingenious amateur, and he will find that a stock of small pieces will often get him out of a difficulty, when other materials are unobtainable or perhaps too expensive for the job in hand.

Filing Attachment for the Lathe.

By N. F. F.

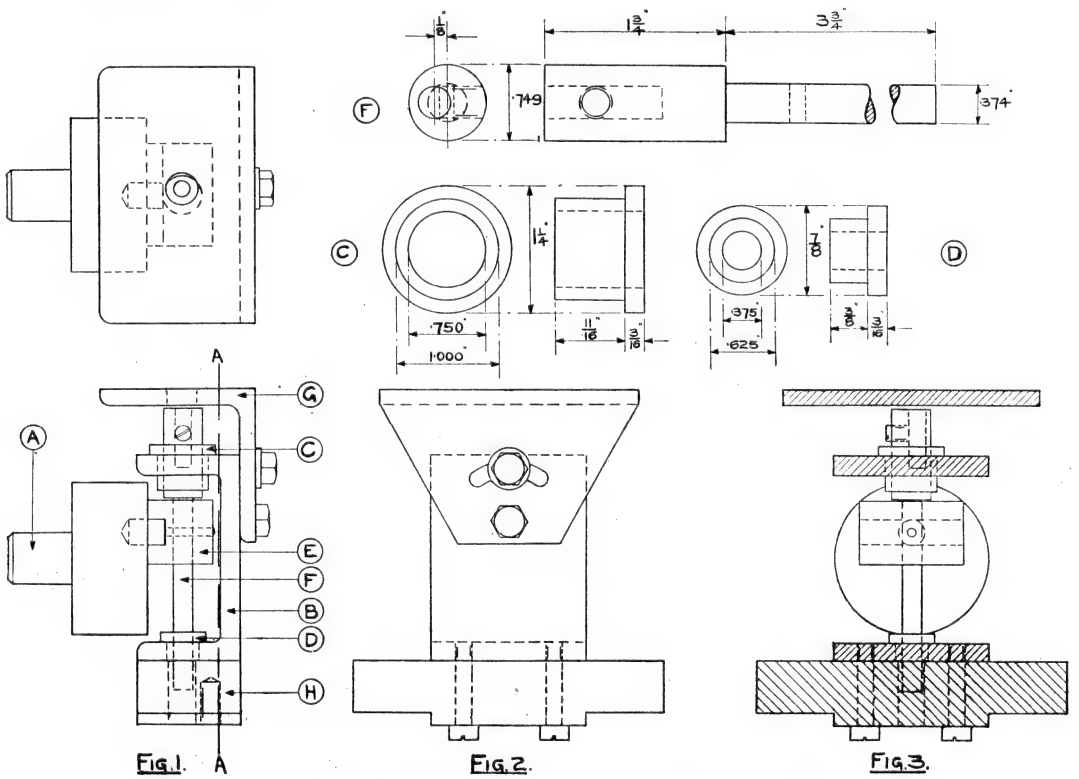
The filing-up of dies, templets and many other jobs by hand at the bench is tiring and slow. The sketch shows a filing attachment suitable for a 3-in. centre lathe, which can be cheaply and easily made.

Fig. 1 shows a plan and side view, Fig. 2 a view looking towards the lathe chuck, whilst the section (through AA, Fig. 1) Fig. 3 gives a view of the reciprocating motion. The 3-in. diameter stud A is held in the lathe chuck, the $\frac{1}{2}$-in. diameter driving pin being $\frac{1}{2}$ in. from the centre. The channel B is machined square on the three outside faces, the top and bottom flanges being bored for the phosphor-bronze bushes C D, which are pressed into place.

The block E is $1\frac{1}{4}$ ins. square, 2 ins. long with a slot $\frac{1}{2}$ in. wide. The spindle F is made to the dimensions given, and finally pinned in the position shown in Figs. 1 and 3, *i.e.*, driving pin at top with the top of the block E just clear of the bottom of the bush C.

The table G is angle iron, the faces of the inner and top flanges being machined square. The method of swivelling this table for filing the clearance in dies is obvious. The entire attachment is mounted on the block H, which is made to suit the bed of the lathe.

Machine files with round shanks are not expensive and can be obtained from any tool stores.



A Filing Attachment for use on a 3-in. Centre Lathe.

Model Aeronautics.

An Elastic-driven Pusher Model.

By W. Hardin Osborne.

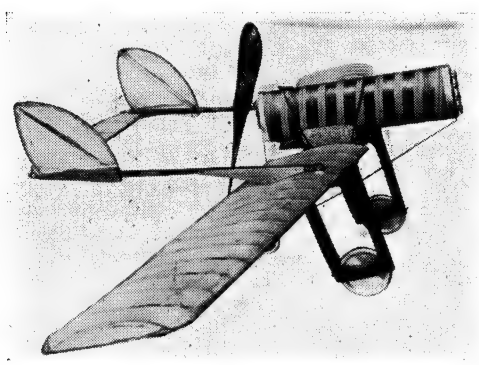
THE chief characteristic of this model is the power unit, which, in reality, is one drive 3 ft. 4 ins. long divided into four separate drives transmitting their power to the propeller through the agency of six gear wheels.

The bearing for each gear-wheel shaft is a No. 11 Bowden nipple, the cup end of which houses six 1/16th-in. diameter steel balls, acting as a thrust race. The friction losses in this type of drive are therefore reduced.

When winding up the propeller, the top drive commences to knot along its length and starts to turn the top front gear which in turn transmits the power to the top rear gear then back again through the third gear in front and so on to a final fixed point at the rear of the fuselage.

The relative speed of each drive differs, but the propeller revolutions remain constant.

Fuselage construction is of the monocoque type, made from a 7-ft. strip of 1 mm. three-ply by $1\frac{1}{8}$ ins. wide, wound around a piece of stream-line tubing $3\frac{1}{2}$ ins. deep, the butt joint being held in position by a continuous length of glued tape. When the tube is withdrawn a very strong fuselage is obtained weighing only $1\frac{1}{2}$ ozs.



Elastic Geared Drive Pusher Model.

The end caps are 22-gauge aluminium to which is riveted a brass strip holding the bearings. Each drive has fourteen strands of $\frac{1}{4}$-in. by 1/32nd-in. elastic, total weight of elastic being 3 ozs.

Owing to the immense pull the gears are silver-soldered to the shafts.

The propeller is $13\frac{1}{2}$ ins. diameter and the pitch of the blade being 13.9, carved from solid walnut.

Wing section is a special high-lift type covered top and bottom with pure silk, treated with one coat of transparent dope and one coat of shellac. Span 4 ft. 4 ins., chord $6\frac{1}{4}$ ins., depth $\frac{7}{8}$ in.

The fin and tail-plane booms are attached to the front and rear spar by means of split-pins, facilitating removal and packing.

Chassis legs are constructed from 1 mm. three-ply and attached to the underside of main-plane with an elastic band; this point is essential in the case of bad landings allowing the structure to collapse instead of breaking. The same applies to the fuselage, which is held in a balsa wood cradle with elastic bands. Fins and tail-plane are of the general type of construction, *i.e.*, piano wire, wood and silk covering.

It will be seen by the illustration that the wings are swept back, the reason of this being to counteract the overhung weight of tail unit, and to bring the centre of gravity in correct relationship to the centre of pressure, which is .26 of the chord from the leading edge.

Incidence of main plane is $2\frac{1}{2}^{\circ}$ and diehedral 2°. Tail-plane is set at same horizontal plane as the propeller-shaft.

Chassis wheels are 3 ins. diameter and trailing wheel $1\frac{1}{4}$ ins. diameter, attached by piano wire.

Weight of model complete is $19\frac{1}{2}$ ozs., and in consideration of its size is lightly loaded, being approximately $8\frac{1}{2}$ ozs. per sq. ft.

It will be seen by the illustration that the design lends itself to a tail-less type of model. This can be accomplished by removing the booms and tail unit, sweeping the wings further back and introducing lateral controlling surfaces at the wing tips.

Society of Model Aeronautical Engineers.

Flying Meeting at Brooklands Aerodrome.

The members of the S.M.A.E. and affiliated clubs have been invited by the Brooklands School of Flying, Ltd., to give a display of model flying before their pupils on Sunday afternoon, December 7.

A competition for fuselage models (duration) will be held, the prizes being:—

1st prize, a trial lesson in a Brooklands School machine.

2nd prize, a free flight in a Brooklands School machine.

3rd prize, ditto.

These prizes have been kindly presented by the Brooklands School of Flying, Ltd., who have also promised to show members, and their friends, over the school workshops, etc.

It is hoped that as many members of the S.M.A.E. and affiliated clubs as possible will support the meeting in view of the excellent prizes offered.

Admission to the aerodrome will be by free pass, or by paying at the gate. Will those desiring to be present please write to me by return for their free pass, also stating whether they wish to take lunch at the restaurant on the aerodrome, Captain Davis having made arrangements for an excellent 2s. lunch for those who will be arriving early. The nearest station to the aerodrome is West Weybridge, from Waterloo.

Hon. Secretary, S. G. MULLINS, 72, Westminster Avenue, Thornton Heath, Surrey.

The Model Aircraft Club.

Parliament Hill.

The weather and the use of another flying field (Lea Marshes—5th Wing, T.M.A.C.) rather reduced the number of active members at Parliament Hill on Sunday, November 23. In spite of a very adverse and boisterous wind, four of the members were able to get in some remarkably good flights. The conditions prevailing demonstrated very clearly the necessity of accurate launching, and when a launch was made which was below the standard required, the wind beat the model down, in some cases with disastrous results.

Mr. Mann was amongst the earlier casualties. Many times did the elements combine to push down his automatically-controlled model, and on each occasion it came through with flying colours; but the wind grew short-tempered (or he grew ambitious), and on the final attempt it attacked in particularly vicious gusts from (apparently) all points of the compass, and the resultant spinning nose-dive attained such velocity that the wing broke in the air. This was very unfortunate, but productive of many new ideas on the subject of spar strength at the point of attachment to the fuselage.

Messrs. Buckland and Fennell were doing well, and we hope to see some great performances from this section (Kenton and Harrow Squadrons) at the inaugural meeting of the 1st Wing on Hampstead Heath Extension next Sunday.

Mr. C. H. Debenham had his monoplane out fitted with larger tail surfaces and fin, which enabled it to put up quite the best flight of the day, both on distance and duration. He also had his "Puss Moth," which was first tried out at the indoor flying meeting in the Horticultural Hall, and, although it certainly belongs to "The Midgets," it has a performance superior to some of the larger class of models and is undoubtedly very "life-like" in flight.

"Resurgam" appeared to be giving some trouble getting into trim, but when finally fixed was doing very well towards the end of the morning.

At about 12.30 p.m. (noon) a "strange white bird" appeared to brave the elements, but apparently its owner decided that English conditions were somewhat more exacting than those prevailing "across the pond," and after one short hop it disappeared to await a more favourable day. It appearance was so fleeting and its departure so sudden that we were not able to get a good view of it, but no doubt the future holds some very interesting developments.

Coventry, No. 9 Squadron, T.M.A.C.

Under the leadership of Mr. M. Pemberton this squadron is going ahead, and the first meeting (non-flying) was held on Saturday last to arrange the members in their various flights. The question of a central flying ground is not yet settled, but it is hoped to have this fixed up by the end of the week. Will all modellists in the district who are interested please get in touch with Mr. M. Pemberton, Y.M.C.A., Coventry, or our Hon. Secretary.

Wimbledon, Wings 1 and 12, T.M.A.C.

Mr. Willis continues to put up remarkably good duration performance with his machines and the consistency of his flights is beginning to be looked upon as the regular thing to look for whenever any flying is taking place upon Wimbledon Common; in fact, if he goes on like this the Common will have to be stretched.

Mr. Austin has been out recently with a beautiful biplane model which seems to give every promise of being a star performer in the near future.

Mr. Dent always gives a good show, and although his flights are not of great duration they have the quality of being extremely "life-like."

Mr. Trevithick is also putting in some very useful work on the compressed-air powered machine.

Hon. Secretary, A. E. JONES, 48, Narcissus Road, Hampstead.

Correspondence.

Model Airships.

DEAR SIR,—Mr. Moody's letter in the November 20 issue of the *M.E* has interested me, for you may remember that some months ago we discussed the possibility of model dirigible building, and I promised to look into the matter.

On paper the results were so disappointing that I put my calculations aside, where they have remained until to-day. Taking the R.101 as the prototype, the figures for a model of the length suggested by Mr. Moody are these:—

Length	8.0 ft.
Max. diameter ...	1.44 ft.
Volume	7.8 cu. ft.
Lift	8.5 ozs.
Silk covering	4.3 ozs.

This leaves only 4.2 ozs. for skeleton, motors, and surplus lift, which is, of course, inadequate. Such a model would be about 1/90th full size.

Mr. Moody contemplates a model of much greater girth than that I have just stated. To have a volume of 19 c. ft. the maximum diameter would be about 2.5 ft., which is nearly one-third of the length. The R.101, by no means a slender ship, was in length more than five and a half times its maximum diameter.

The lift of hydrogen is less than 1.25 ozs. per cu. ft. The R.101, with a gas capacity of 5,000,000 cu. ft., had a lift of 150 tons. This is 68 lbs. per 1,000 cu. ft. or 1.1 ozs. per cu. ft.

I have taken the silk covering of the model at 100 sq. ft. to the pound, which is very light. Proofed silk weighing as little as this would very probably be porous. Goldbeater's skin might be lighter, but I cannot obtain any exact information about this material. Japanese tissue such as is used on some model aeroplanes might be employed, but I do not like to think of such an inflammable material being used to encase hydrogen.

My further calculations indicated that a model dirigible of 12 to 16 ft. long might be built with some success, but considerations of housing and cost brought me to the conclusion that a vessel of this size was outside the range of any but the most fortunate. It was certainly beyond my range, and I pursued the matter no further.

I hope my figures will prove useful to Mr. Moody, and to any others who are considering model airships, for it seems a pity that nothing of the kind has so far been constructed.—Yours faithfully,

RICHARD LANGLEY.

The "M.E." All-Mains Three.

An Extremely Efficient "All-Mains" Wireless Receiving Set for the Model Engineering Constructor.

By H. J. Barton Chapple,
Wh.Sch., B.Sc. (Hons.), A.C.G.I., D.I.C., A.M.I.E.E.

BEFORE dealing with the third wireless receiver I have had the pleasure of presenting to readers of THE MODEL ENGINEER I should like to take this opportunity of thanking the many readers who have written and expressed their satisfaction with the original "1500" set and its "Junior." It is always gratifying to a designer to know that his efforts have proved satisfactory. Naturally, a small number of queries arose, but that is inevitable with any home-constructed wireless set, and is attributable mainly to the designer assuming a measure of wireless knowledge which is sometimes a shade too high, coupled with a failure on the part of the constructor to comprehend one or two details which have to be explained to him in different phraseology in subsequent communications.

Reader's Own Christmas Box.

With the increasing popularity of receivers which can be fed entirely from the mains and thus do away with auxiliary sources of supply for high-tension, low-tension, and grid-bias, your Editor felt it was opportune to present a set of this nature to readers in time for Christmas. Potential constructors can then make themselves a seasonable Christmas Box by building the "All-Mains Three."

In an effort to produce a design worthy of the high standard maintained by THE MODEL ENGINEER, I have spent many hours on this set, and I am convinced that in its final form this receiver will find widespread favour.

Bearing in mind the skilled capabilities of readers, I was anxious to devise something which would give full rein to their prowess. I therefore departed from the more usual form of constructor's set with controls distributed over a large panel coupled with a single baseboard of undue proportions. Since the mains unit had to be incorporated with this set I decided to make a double tier arrangement so that the finished receiver, when housed in its cabinet, would more nearly approach the commercial and professional sets in appearance. A glance at the accompanying photographs and those which will appear in the two subsequent issues will show how I achieved my desire.

Centralised Controls.

The set slides into its cabinet from back to front so that only the *centralised* controls show in the centre wooden cut-out and this immediately brings about a handsome appearance as well as overcoming the difficulties brought about by trying to fit panels into cabinet fronts, this generally culminating in gaps at the sides or top which look unprofessional.

Let us examine for a moment the features of this all-mains set. First of all, as its name implies, there is not an H.T. battery, L.T. accumulator or G.B. battery needed. All the power is derived from the household electricity supply. The model I am presenting is suitable for *alternating* current mains and *not direct* current mains. The mains transformer can be purchased from the makers to suit your own voltage and frequency, these facts being given on the supply meter in the home. Another point

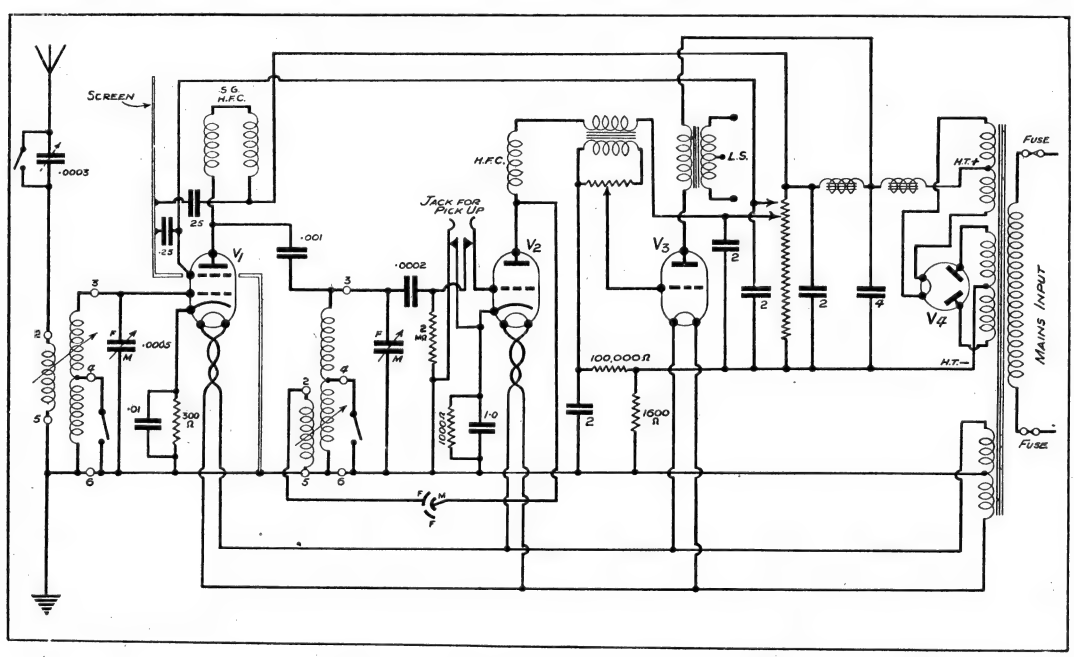


Fig. 1.—The Complete Theoretical Circuit of the "M.E." All-Mains Three, showing exactly how each stage is connected.

to be emphasised is that there is absolutely no danger in using an all-mains set of this nature. It is just as simple to switch on as the household iron or vacuum cleaner, this, of course, assuming that the instructions I shall give are followed implicitly.

Sensitivity and Selectivity.

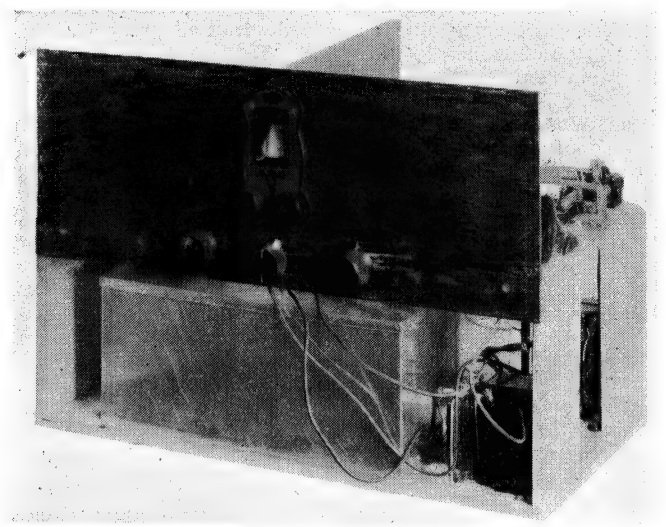
My tests on the set have spread over a considerable period, and show that the selectivity is ample for normal situations (I live within seven miles of Brookman's Park), while so far I have heard most of the European languages by tuning in the principal Continental transmissions on the loud-speaker. There is considerable volume and first-class reproduction with an absence of mains hum. Furthermore, handling the set presents no difficulties once the preliminary adjustments have been made on site to suit individual conditions of locality and environment.

So much for the general remarks on the set, and we must now turn our attention to particulars.

and to which I shall return in a moment. There is a loose-coupled aerial circuit provided by a rotor coil, which can be adjusted in relation to the tuned grid coil in order to obtain the best balance between selectivity and signal strength. When the semi-variable condenser is used in conjunction with this rotor coil, the set will accommodate itself to any type of aerial.

The ranges of 250 to 550 metres and 1,000 to 2,000 metres are allowed for in the two tuned circuits, short-circuiting switches across a section of each coil, and operated from one control, cutting out part of the windings when using the lower range. The same switch control short circuits the .0003 mfd. semi-variable condenser on the long waves as generally this condenser is not required when working on the 1,000 to 2,000-metre range.

Both coils are tuned by ganged variable condensers. In the Formo make chosen, aerial circuit capacity balance is secured by moving slightly the stator plates of the left-hand con-



The "M.E." All-Mains Three. The controls at the front are centralised and this ensures ease of working.

Choosing Components.

At the end of this instalment is included a list of the components I employed. The names of the manufacturers of these components are also shown together with alternatives in many cases, the first name given being that used in the original set. I strongly advise constructors not to depart from this list, as my choice has only been made after very careful deliberation with a view to ensuring that each item contributes its full quota to the overall efficiency.

To save delay it would be to the constructor's advantage to start collecting all his gear together at once so as to be in readiness for the instructions dealing with the making, which I propose to give in full next week.

In the meantime, I want to trace out the complete theoretical circuit with you for I always feel this is the wisest plan. It makes quite sure that you will appreciate intimate details which might get overlooked in the course of constructional remarks.

The Theoretical Circuit.

Fig. 1 gives the complete schematical representation, and, starting at the aerial lead-in, we meet a semi-variable .0003 mfd. condenser across which is shown a short-circuiting switch

denser, thus making gang tuning a pleasure and ensuring the rotors being in step and not several degrees out of phase as often is the case.

Screened-Grid High Frequency.

V_1 is the indirectly-heated cathode screened-grid valve, automatic grid-bias being applied by the 300 ohm (note that the symbol for ohm is Ω) resistance shunted by the .01 mfd. condenser. The inclusion of grid-bias in this H.F. stage is advisable as it not only reduces the total plate current but adds to the measure of selectivity.

The amplified high-frequency signals passing into the plate circuit are "choke fed" to the tuned-grid circuit of the detector valve V_2 through the agency of the screened-grid high-frequency choke (S.G.H.F.C.) and .001 mfd. coupling condenser.

Provision for a Pick-up.

Grid-leak and condenser rectification is employed for V_2 (another indirectly-heated cathode valve), but in order to satisfy those readers who would like to use a gramophone pick-up with the set and make it serve as a radiogram, you will notice that a jack has been provided. For radio working the connections

are normal, but once the plug connected to the pick-up is inserted into the jack, the valve V_2 no longer functions as a detector but becomes the first stage of the low-frequency amplifier. Automatic grid-bias is brought into play by cutting out the "rectifying components" and replacing with the 1,000-ohm resistance shunted by the 1.0 mfd. condenser. The simple process of inserting the plug into the jack brings this about without any further alterations, normality being resumed on withdrawing the plug.

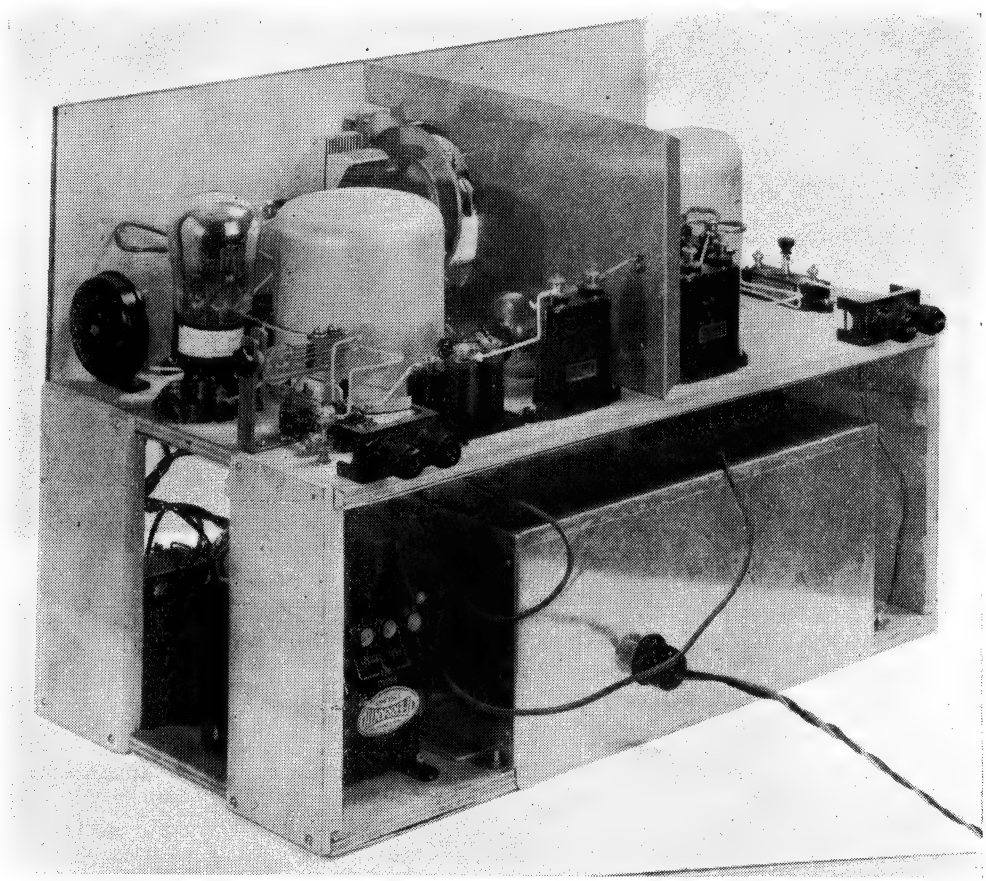
Smooth Reaction.

Capacity reaction control is given by means of the variable condenser joined in series with the rotor coil located inside the tuned-grid coil. By being able to adjust the position of this rotor both in a vertical and angular direction it is possible to attain the desirable condition of correct balance between inductive and capacity reaction giving smooth control. The .0003 mfd. reaction condenser I have specified is of the differential type, but my own tests seemed to show that there was little to choose between differential or straight capacity reaction, and for this reason in Fig. 1 you will notice one set of fixed plates are left disconnected. I shall refer to this again in the operating instructions.

The signals now pass to the output valve V_3 (directly-heated cathode) by means of a low-frequency transformer. Some form of volume control was felt desirable, and to make this control serve both in the case of radio reception and gramophone pick-up working I decided to use a high-resistance potentiometer as a shunt across the L.F. transformer secondary. This worked quite well in practice, the grid of V_3 being joined to the movable contact.

Isolating the Loud-speaker.

The loud-speaker is isolated from the normal anode current of V_3 through the medium of an output transformer. This results in an absence of shock when touching the loud-speaker terminals, and as there are three step-down ratios available one can find that best suited to the windings of the loud-speaker.



The "M.E." All-Mains Three. Notice how the back view of the set reveals quite clearly the double-tier arrangement.

Since V_3 has its filament directly heated the automatic biasing arrangements differ from those adopted from V_1 and V_2. Instead of H.T.– from the eliminator being joined direct to earth we have two resistances of 1,600 ohms and 100,000 ohms arranged as shown with a 2 mfd. condenser to apply the appropriate negative bias to the grid.

The Eliminator Side.

Referring now to the eliminator section, I have taken every possible means to ensure a smooth and adequately decoupled source of high-tension for feeding the valve anodes. The mains input transformer has a single primary and three secondaries. These, in turn, feed the receiver valve filaments, the rectifying valve fila-

ment and the rectifying valve plates. H.T.+ (the centre tap of the rectifying valve filament secondary winding) passes through two smoothing chokes and reservoir condensers before we reach the tapped potentiometer whose other end joins to H.T. – (the centre tap of the rectifying valve plate winding). Each H.T. feed is thus smoothed and decoupled, an essential feature if efficient working with an absence of mains hum and "motor-boating" is desired.

I think this covers most of the points that call for an explanation at this juncture, and next week I shall deal fully with the construction and assembly of the set. Bear in mind that although the first cost of this set rules slightly higher than a battery-fed one, the running costs are negligible. Over a period of time, therefore, the financial side more than balances itself, but, what is perhaps more important, your set is *always* working at maximum efficiency. There are no run-down H.T. batteries to worry about or the constant charging of L.T. accumulators, two factors which so often detract from the joys of radio.

(To be continued.)

The Components Required.

One special cabinet with two baseboards 18 ins. by 9¾ ins. by ⅜ in. (W. & T. Lock, Ltd.).
One metal-backed Ebonart panel, 18 ins. by 7 ins. by ¼ in. (Redfern's Rubber Works, Ltd.).
One .0005 dual gang condenser complete with drum dial (Formo).
One type J Formodenser (Formo, Igranic Electric Co., Ltd.).
Two dual range coils (type R2R) together with two coil screening covers type CCS (Colvern, Ltd.).
Four valve-holders (one 5-pin universal, one 5-pin ordinary and two 4-pin anti-phonic) (Whiteley Electric Radio Co., Ltd., Formo, Wright & Weaire, Ltd.).
One .0003 mfd. differential reaction condenser (Jackson Bros.).
One screened-grid H.F. choke (L. McMichael, Ltd., Wright & Weaire, Ltd., A. F. Bulgin & Co., Ltd.).
One standard high-frequency choke (Igranic Electric Co., Ltd., A. F. Bulgin & Co., Ltd., Wright & Weaire, Ltd.).
One OPM3 output transformer (Ferranti, Ltd.).
One volume control (Varley, Ltd., Wright & Weaire, Ltd.).
One two-way rotary change-over switch (Wright & Weaire, Ltd.).
One low-frequency transformer (Nicore I) (Varley, Ltd., Partridge & Mee, Ltd., Igranic Electric Co., Ltd.).
One .001 mfd. mica condenser, type 620 (Dubilier Condenser Co. (1925), Ltd., Telegraph Condenser Co., Ltd.).
One .0002 mfd. mica condenser, type 610 (Dubilier Condenser Co. (1925), Ltd., Telegraph Condenser Co., Ltd.).
One 2 megohm grid-leak (Dubilier Condenser Co. (1925), Ltd., Telegraph Condenser Co., Ltd.).
One .01 mfd. type BB condenser (Dubilier Condenser Co. (1925), Ltd., Telegraph Condenser Co., Ltd.).
Two .25 mfd. type BB condensers (Dubilier Condenser Co. (1925), Ltd., Telegraph Condenser Co., Ltd.).
One 1 mfd. type BB condenser (Dubilier Condenser Co. (1925), Ltd., Telegraph Condenser Co., Ltd.).
Three 2 mfd. type BB condensers (Dubilier Condenser Co. (1925), Ltd., Telegraph Condenser Co., Ltd.).
One 2 mfd. type BC condenser (high voltage) (Dubilier Condenser Co. (1925), Ltd., Telegraph Condenser Co., Ltd.).
One 4 mfd. type BC condenser (high voltage) (Dubilier Condenser Co. (1925), Ltd., Telegraph Condenser Co., Ltd.).
One 20,000-ohm tapped potentiometer (A. F. Bulgin & Co., Ltd.).
One 20-henry L.F. smoothing choke (A. F. Bulgin & Co., Ltd).)
One 20-henry L.F. smoothing choke (Igranic Electric Co., Ltd.).
One power transformer type 2A/2, with secondary 200-0-200 volts, 2-0-2 volts, and 4 volts 3 amperes centre tapped (Partridge & Mee, Ltd.).
One double-circuit jack and plug (Igranic Electric Co., Ltd.).
Four insulated terminals: Aerial, earth, L.S.–, L.S.+, and two terminal mounts (Belling & Lee Ltd.).
Six wire-wound resistance links, three 600 ohms, two 1,000 ohms, and one 100,000 ohms (A. F. Bulgin & Co., Ltd.).
One flush mounting mains plug and socket (A. F. Bulgin & Co., Ltd.).
One S.G. valve anode connector and two baseboard fuseholders with ½ ampere fuses (Belling & Lee, Ltd.).
Two crocodile clips (A. F. Bulgin & Co., Ltd.).
Two sheets of aluminium 18 ins. by 9¾ ins. by 1/32nd in., one aluminium cross-screen and one aluminium box (Whiteley Electric Radio Co., Ltd.).
Four packets of yellow Glazite connecting wire and two yards of 5 mm. rubber-covered flex (London Electric Wire Co., Ltd.).
Four valves (for specification see text) (Mullard Wireless Service Co., Ltd.).

Science Museum Models.

Amongst recent acquisitions at the Science Museum, South Kensington, are the following:

Model of 132-000-volt overhead transmission line, illustrating the grid scheme adopted for the distribution of electricity in Central Scotland, with separate larger scale models of the supporting towers (presented by British Insulated Cables, Ltd., Prescot).

An optical glass furnace (scale 1:8), showing a section through a two-pot furnace with mechanical stirrer in position (presented by Messrs. Chance Bros. & Co., Ltd.).

Large model showing modern methods of stage lighting, designed by Mr. C. Harold Ridge, A.R.S.M. This model, which is displayed in an Annexe to Room XXXI, represents a stage with scenery in position, and by manipulating the switches provided, a most fascinating series of colour effects can be produced.

The Educative Value of Museum Models.

In an address to an assembly of museum representatives in New York this year, Sir William Bragg remarked that the operating model was one of the most valuable features of a Science Museum, but pointed out that qualified instructors should also be present to explain the models, by which means they would become a most fundamental measure of instruction.

MODEL MARINE NOTES

A Scale Model of R.M.S.P. "Trent."

By C. Taylor.

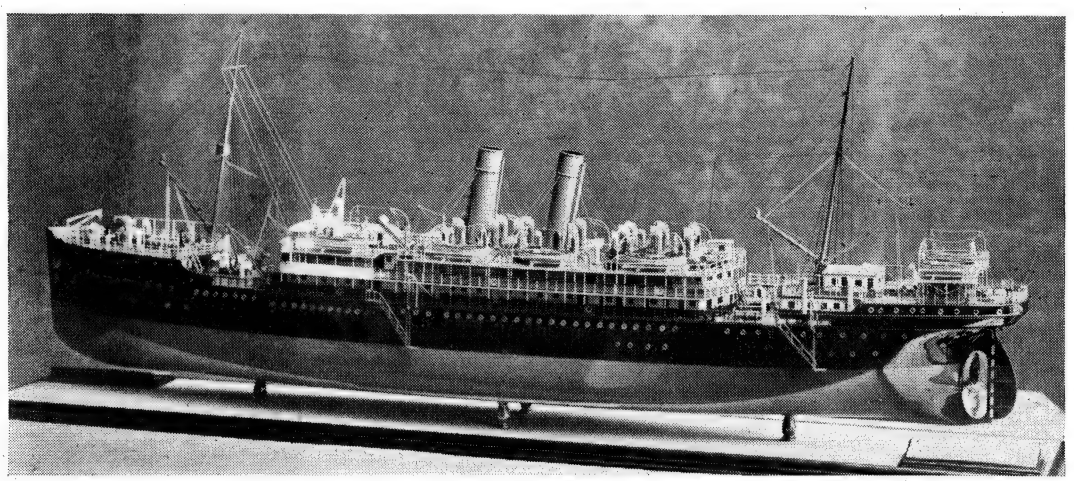
THE accompanying photograph shows a scale model of the Royal Mail Steam Packet Co.'s liner *Trent*, which I completed shortly before this year's MODEL ENGINEER Exhibition, where she was awarded a Bronze Medal.

My calling in civil life is that of a brewer's agent, but the few spare hours I get I devote to this class of modelling. The actual *Trent* was in service immediately after the war as a troopship, and during the years 1918-20 I served on board as ship's adjutant. During that period I surveyed and made my $\frac{1}{8}$-in. scale drawings of all decks, fittings, etc. The lines of the hull I could not obtain, even from her owners, so these I faired up and completed on my drawing-board at home. It was not until 1926 I actually commenced building, finishing the model complete in glass case this year.

The hull is constructed on the layer system, completely hollowed out, fitted with stern-tube, glands, etc., but there is no machinery. It is an exhibition model, and it was my sole aim to build her superstructures to the smallest detail. The decks are constructed from 1/16th-in. hollywood, all "planked" to scale. Hatch coamings, deck-houses, funnels, fiddleys, etc., are from sheet copper, the cabins themselves having panelled doors, rails and correct glazed ports, which can be illuminated by means of ten 2-volt bulbs inside the hull.

The winches, hydraulic cranes, wire reels and derricks have been built up from sheet copper, pins, even watch wheels being utilised. The ship's boats (twelve) have been hand carved from pine and are complete with seats, thwarts, knees, rudder, ropes, etc.

My purchases from Messrs. Bassett-Lowke consisted of stanchions, side ports, anchors, rigging blocks and ventilators. The hull is finished "coachwork" black freeboard, pink below waterline; best flatting and varnish being used—deck-houses and fittings are painted with enamel. I have mounted the complete model on brass columns and base-board, the whole finally fixed in a mahogany and glass case, also self-constructed. No lathe has been used—all file work. This class of modelling has little or no support in my district (Wolstanton, Staffs.), and I should be very pleased, through the medium of your journal, to hear from any enthusiast in this class of work, whether drawings, hull construction, or deck fittings.



Mr. C. Taylor's Exhibition Model of the R.M.S.P. "Trent."

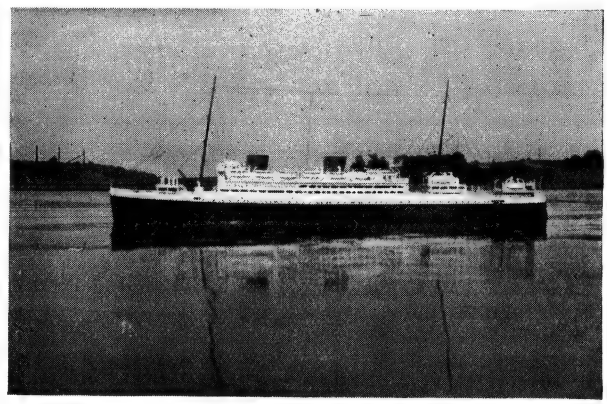
An Electrically-driven Model of M.S. "Asturias."

By Eric W. Foster, F.I.M.T.

THIS model of the Royal Mail Steam Packet Company's motor vessel, the *Asturias*, which took nine months to make, was awarded first prize during the Bournemouth Regatta and the silver cup for the best boat on the water.

It is built throughout of metal. The hull is made of 28-gauge sheet steel in four sections, the two sides "bellied" and shaped the correct form, and the stern, which is of the naval type, made in two pieces, the whole soldered together. The ship is 3 ft. 2 ins. long and about 4-in. beam. The top edge of the hull is rolled round a $\frac{1}{8}$-in. rod and ribbed inside with $\frac{1}{8}$-in. rod at various intervals. This makes a nice rigid job and at the same time is light. It is not built entirely to scale as the only assistance available was the ordinary cabin plans obtainable from the company and some snapshots taken of the

various decks and fittings on board the boat itself. In order to trim it correctly, when the boat was finished, it was found necessary to construct a thin box-like keel, which did not in any way spoil the contour of the hull. Into this was poured lead shot until the correct trim was obtained and then sealed with melted paraffin-wax.



Mr. Foster's Model on the Water at Bournemouth.

The boat is driven by electricity, and, at night, when lit up, looks most realistic travelling across the water. Incidentally, three different circuits are used in the lighting to get the proportion of light correct. The current is supplied from three 2-volt Exide wireless batteries, type WPY-4, which seem very suitable.

The electric motor is made from an ordinary 6-volt rotary motor-horn, the backplate of which was cut away where necessary, drilled as much as possible to lighten it, and made suitable to fit the hull. The motor was made to drop on to two brackets each side and screwed so that it might be detached quite easily.

At the end of the motor-shaft was fitted a universal coupling. The drive is taken to the two propellers from the single electric-motor shaft through the medium of a little gearbox, which is constructed with ordinary Meccano gears. This gearbox was made with four small gears of the same size. Two $\frac{1}{8}$-in. steel plates were drilled and kept at the correct distance apart by distance-pieces soldered at intervals. The drive of the motor was taken through No. 2 wheel forward. No. 1 to the rear, connected the port-side propeller. No. 3 gear is an idler gear. No. 4 then takes the drive to the starboard propeller. In this way, the propellers are made to turn in opposite directions.

At the end of each propeller tube is fitted the ordinary type of packing gland with provision for adjustment with locking-nut. The Exide batteries also supply the current for the numerous little flash bulbs throughout the ship. As each deck is made detachable, it was necessary to make two junction-boxes in which the various light leads can be plugged in. Each separate plug and socket is painted a different colour, so that no mistakes can be made when the decks are removed and replaced. The very small electric bulbs used for the mast head, port and starboard and deck flood lights, were pea lamps obtained from the Economic Electric Co.

All the cabins and ship's boats are made out of the thinnest tinned sheet obtainable. Old motor-oil tins were found to be too thick. All the windows are cut out with a small chisel and finished with a file, and behind is stuck very thin celluloid to give the appearance of glass. By spreading a film of Rawlplug's "Durofix" behind each porthole, the appearance of glass is excellent and it also makes the portholes watertight. All the dents and roughness caused in the bending and shaping of the hull were made to disappear by filling in and rubbing down in the manner of coach-painting. An excellent white cellulose paint called "Porcelainit" was used for the deckhouses, etc.

A good deal of time was spent on details, which was well worth the trouble, although there are not by any means all the ventilators and deck fittings there should be. All the ship's rigging, wireless aerial, etc., are of cotton and thread. The ship's boat covers are made out of parchment paper, carefully cut and stitched under the boat in the correct manner. Another small detail that looks well is the steel ladder and gangway up the rear funnel, which is made up of steel wire and the use of solder. Each section of the railings is made up with wire of the correct proportion. First the stanchions were soldered in position, then flattened brass wire was drilled where necessary and dropped over the stanchions and soldered. The ends of the stanchions were then cut off and filed clean.

The boat is made to operate from the outside, three ventilators work the lights, motor and rudder. All three are over the stern deck. The lights and motor are worked through a switch-block underneath. The roof of the winter-garden is made detachable to get at the fuse underneath. The whole of the centre section is detachable, also the forward and stern decks.

Power Boat Regatta at Brockwell Park.

AT the Regatta held by the South London Model Power Boat Club on November 9 at Brockwell Park, S.W., the first event, a steering competition, was won by Mr. Oakley's *Snooks*.

The second event, a 300 yards "round the pole," resulted in a win for Mr. French's new two-stroke engined hydroplane *Louise* in 36 secs., Mr. Berryman's *Miss England* being second in 65 secs.

The third event (which is held to give everyone a fair chance) was a 500 yards "round the pole" handicap, and was won by Mr. Oakley's *Snooks* in 62 secs.; Mr. Turner's *No.* 64 second in 68 1/5th secs. Both these boats were allowed 9 secs. over Mr. French's *Louise*, who started scratch, but was unable to finish the course. After the Regatta Mrs. Vanner kindly presented the prizes.

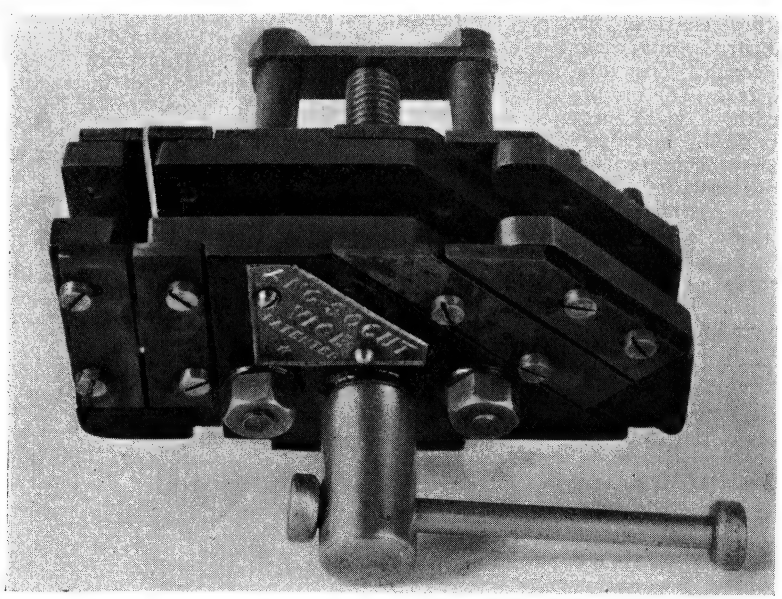
Weekly meetings are held on Sundays from 11 a.m. to 2 p.m., and enquiries should be made in the enclosure at the lake side. Written enquiries concerning the club should be addressed to Mr. W. J. Hutchins, 5, Helix Road, Brixton Hill, S.W.

New TOOLS AND SUPPLIES

The "Ang-Sq. Cut" Vice.

This is an entirely new bench accessory, which has been patented, and is manufactured solely and marketed by Messrs. The Wren Tool Co., of 174, Sixth Avenue, Manor Park, London, E.12. We have recently examined and tested examples of these vices, which are put up in two sizes, numbered 1 and 2, of which the first is the smaller. There is no doubt that, first, the purpose for which it is designed will appeal particularly to those who, wisely, rely upon good hand-tool methods to obtain accuracy; and, secondly, that the manner in which it is obtained and maintained is both sound and reliable. The photo (Fig. 1) shows a front top view of the No. 1 vice, which, as its name implies, is intended for hand-sawing stock both square or angularly, rapidly and accurately.

The idea embodies an appliance which is, in effect, a parallel vice, the back jaw of which is the fixed member, and carries, at its base, a lug intended to be held in the jaws of any bench vice. The outer movable jaw carries with it a guide frame, consisting of two parallel cylindrical steel guide bars, running in long guides fixed to the held jaw. The operation is effected by an angular threaded screw carried with the front jaw, and operating in a nut on the fixed jaw. The pair of jaws, of cast iron, are replicas, handed, and are set permanently normal to the frame and screw, and always stand, therefore, parallel all ways with each other. Each jaw is broadly slotted in register with the other, one end vertically, and the other at an angle of 45° to the upright. Upon the outsides, both jaws are machine rebated about the broad slots, and carry, in these rebates, screwed thereto, adjustable hardened-steel saw guides, which have latitude of adjustment, both to set one permanently to angle, and set the other to give a guide slot suitable to just clear all thicknesses of hacksaw blade made. As made and supplied adjusted, they will allow of cutting parallel stock, which must be rather under the full depth capacity in depth, square and at an angle of 45°, well within 2 "thou." of accuracy in the greatest depth, and so flat that it only needs the application of a fine file to remove the saw marks and to obtain the equivalent of a machine finish. The fact of the jaws being of cast iron, and relatively light, does not matter, for the idea of the vice is not to hold by the usual tenacity, but to hold sufficiently firmly to maintain accuracy, which accuracy is gauged by setting the work on to the guides of the jaws. In the case where an odd angle is wanted, one only needs to mark the work off for the angle required on one side, and to clamp it with the marking set to one or other of the slots. It will then come out much more accurate in relation to time of sawing, than could be effected by ordinary sawing to all the lines. This vice acts as a guide for cutting circular or cylindrical stock in all the ways described, excepting the latter, where to get a special angle of cut the stock must be set by protractor or a similar gauge method. However set, any parallel work can be sawn in a minimum of time, accurately, but this minimum of time is not to be further minimised by forcing the saw, any more than it is advisable to force a saw into cut in any form of hand or machine sawing. Forcing a saw nearly always results in forcing it out of line of its cut, and thus risking fracture, whether the saw be guided or not. We find by test that angular or square faces can be readily produced by this guide vice with hand sawing so that mitre or butt joints can be made in round, square and rectangular, solid and hollow metal, nearly enough for all practical purposes for which such joints are needed; and this with a minimum of fitting required.



Messrs. Wren Tool Co.'s "Ang-Sq. Cut" Vice.

The No. 1 vice is 5 ins. long in the jaws,

opens 1¾ ins., and has a depth top of jaw to guides, of 1½ ins. Its cost is 15s. 6d. The No. 2 is the same length. opens 2½ ins., and has a depth of 2 ins. It costs 21s.

It should be clear, however, to readers that a guide depth of rather more than half a saw's width is necessary above the top of the work, at least, to allow of starting a saw in correct alignment, and it is advised that such blades as have a wave form to the tooth setting work more freely through the guides than do teeth with alternate setting. But both work quite well if not forced.

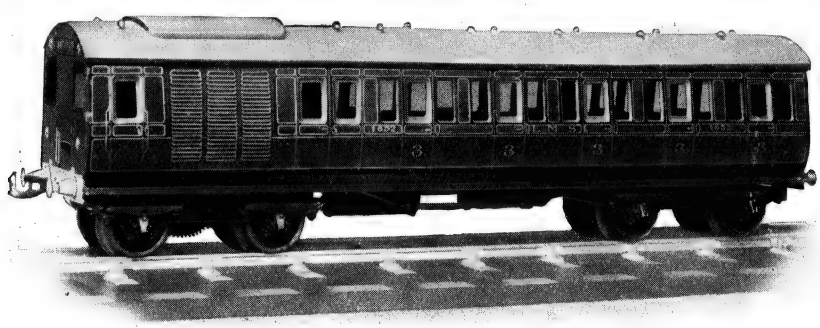
Everything for Models.

The new catalogue just issued by Messrs. Bassett-Lowke, Ltd., is appropriately entitled "Everything for Models." It covers 296 pages, and is packed full of well-illustrated material relating to model locos, model rolling-stock and railway equipment of all kinds, model steam engines, boilers and steam fittings, and castings and materials for engine building. The locos range from a variety of types in o-gauge up to big fellows for garden railways of 7¼-in. and 9½-in. gauge. The "Royal Scot," which has proved so popular in the o-gauge series, figures prominently in the list. A novelty appears in the L.M.S. suburban electric train, in o-gauge, which represents the Euston-Watford electric trains. The train comprises three coaches, viz., one motor-coach, which we illustrate, one trailer coach, and one rear-driven coach. The total length of the train is 3 ft. 6½ ins. The driving unit is an electric motor, with a permanent magnet, wound for 6-8 volts D.C., and fitted with double collectors. The accurate and detailed external finish gives the train an extremely realistic appearance. There are several interesting additions to the stock of tin-plate wagons, the oil-tank wagon illustrated herewith being a good example of the neat modelling shown in these vehicles. In the steam engine section we notice a new 1-in. scale model traction engine, based on one of Aveling and Porter's twenty-ton engines as a prototype. All drawings and castings are available for building this model. A particularly useful section of the list is that devoted to castings and parts for building locomotives, stationary and traction engines, boilers and boat motors. A very complete range of working drawings and blue-prints for locomotive and rolling-stock is also listed. The price of the list is 1s., and it may be fully recommended as a most complete guide to miniature railway and model engineering requirements of every description. Ship and boat models and fittings are not included, as they are adequately dealt with in a separate catalogue.

New Tin-plate Model Wagon
Bassett-Lowke, Ltd.

Small Petrol Engines and Air Compressors.

In order to assist prospective builders and users of his ½-1 h.p. "Supreme" petrol engines, Mr. F. Bullock, F.I.M.T., Culcheth Lane Works, Newton Heath, Manchester, is now issuing a ten-page fully-illustrated pamphlet and full-size working drawing blue prints at the inclusive price of 7s. 6d. per set, which is refunded in the event of a set of castings being purchased within one month from date of purchase of blue prints, etc. This pamphlet embodies a very clearly stated set of instructions (with 26 illustrations) on how to build the engine, and should be of considerable service to anyone who wishes to make himself a well-designed small power unit for workshop or dynamo driving that will stand up well to hard work. Another notable product of the Culcheth Lane Works is the "Supreme" air compressor. Sets of castings for this machine are also supplied together with blue print working drawings at a really moderate price.



The Motor-coach af the new L.M.S. Suburban Electric Train. Bassett-Lowke, Ltd.

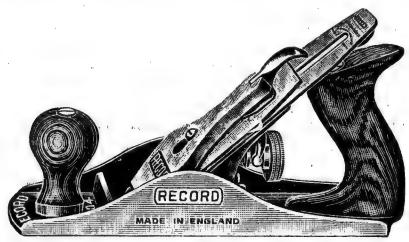
An American Model Catalogue.

Under the title of "Power Models" an excellent 48-page catalogue of model engineering supplies has been issued by Mr. Charles A. Cole, 1,355, Church Street, Ventura, California, U.S.A. Mr. Cole took a leading part in the formation of the Los Angeles Society of Model Engineers, about a year ago, and this body has already progressed well enough to plan their first Exhibition to be held in December. The catalogue describes in detail the "Wall"

gasoline engines, a good range of Stuart-Turner engines, steam-plants and boats, marine boilers, boat motors, and model steam fittings and ship fittings of all kinds. A useful section for the new-comer to model-making is that devoted to metals and materials not obtainable through the ordinary hardware store. The price of the catalogue is 35 cents, post paid. The catalogue is essentially one for the American model enthusiast, most of the goods listed being already available in this country and well known to British readers. The contents have, however, been well selected and are very representative of good model engineering practice; the list may therefore be used with confidence. It is particularly well produced in paper and printing.

British Adjustable Iron Planes.

The manufacture of iron planes with tungsten steel blades in this country is now an accomplished fact, so British retailers and British craftsmen need no longer buy or use the imported variety. For this we have to thank Messrs. C. & J. Hampton, Ltd., Record Works, Sheffield. This firm is now making four types, viz., block planes, smooth planes, Jack planes and shooting or jointer planes, and each type in several sizes. Our illustration shows one of their smoothing planes. The use of tungsten steel for the blades is a feature of all types, and, moreover, the blades of Messrs. Hampton's productions are interchangeable with standard foreign makes. The prices are very moderate, the 8-in. smooth plane has a $1\frac{3}{4}$-in. blade, weighs $3\frac{1}{4}$ lbs., and is listed at 11s. 9d., whilst the 24-in. jointer has a $2\frac{5}{8}$-in. blade, weighs $9\frac{3}{4}$ lbs., and costs 26s. 9d. A full range of spare parts is always available to be drawn upon in case of need. A fuller range of planes is in course of production. Meantime the practical man in need of a high-class British plane will be well advised to investigate the virtues of these new "Record" productions.



Iron Smoothing Plane of British Manufacture.

Popular Gift Books.

Model engineers looking for suitable gift books for their young friends during the Christmas season will find in this issue some excellent volumes offered by Messrs. Sampson Low. These include not only attractive books on engineering, railways and shipping, but general hobbies and sports and games. Any of the books may be obtained through the usual booksellers or may be ordered from The Model Engineer Publishing Department at the prices mentioned plus the postage of 6d. on the 6s. books and 3d. on the 2s. 6d. books.

Queries and Replies

Querists must comply with the Conditions and Rules given with the Query Coupon in the Advertisement Page of each issue.

3939. Choice of Material for 3-in. Scale Traction Engine Components.—A. S. T. F. (Newbury).

Q.—I should esteem it a favour if you will help me regarding a model 3-in. scale traction engine which I am building. On the front of the copper throatplate (boiler) are two steerage brackets supporting the steerage barrel (around which the chains work), and what I seek to know is, what, in your opinion, is the most satisfactory metal to use for these brackets? I prefer cast iron, but I am afraid if I use it that the greater expansion of the copper under steam will either crack the iron or loosen the bronze studs. If I use gunmetal, would it be satisfactory with a cast-iron steerage barrel working in these (gunmetal) brackets?

A.—In actual practice these brackets, being subjected to much stress, are usually of cast steel. The steerage barrel is probably of chilled cast iron simply to resist wear of the chain. We do not think that in the case of your model the unequal expansion will result in fracture of cast iron. We are of opinion, however, that gunmetal brackets will wear better and be less subject to unequal stresses. And if you can bush the gunmetal with suitable phosphor bronze the wear will be correspondingly less. Wear is a rather important factor as it will affect the mesh of the worm gear and add to the natural back lash brought about by stretch in the steering chains. A cast-iron barrel will be quite satisfactory with gunmetal bearings. Indeed, more so than with cast-iron bearings, as like materials cut each other.

3960. Converting Starter-motor to Charging Dynamo.—T. C. G. (Scunthorpe).

Q.—I have a motor which has been used for car starting and wound for 6 volts 100 amperes input. It is geared internally and also has two pinions on the shaft extension, one of which has a free-wheel action. I propose to do away with the gearing and convert the machine to an ordinary belt drive, rewinding it either as a motor to drive a small lathe from a 250-volt supply, or, if this is not practicable, as a generator for accumulator charging, to give 25 volts 10 or 12 amperes.

A.—There are no dimensions given of this machine, nor any indication as to whether it is of two-pole or four-pole design. This makes it a little difficult to advise, but as a rule starter motors are of four-pole design, and another feature is that the winding space on the field poles is usually very restricted. Although there is ample room for the heavy gauge wire and thin insulation which suits these very low-voltage windings, it makes it very difficult to find space enough for high-voltage windings where much more insulation has to be employed. Again, the large commutator with a small number of bars, and the existing copper gauze brushes are also unsuitable features in the design of motors intended to work off high voltages. It would probably be much more satisfactory, therefore, to rewind this machine as a 25-volt 10-ampere shunt generator, leaving the brushes and commutator as they exist at present; but in order to give a winding specification it will be

necessary first to know the diameter and length of armature, number of slots, size of commutator and number of segments; position of brushes relative to the poles; and number and size of pole-pieces. If this correspondent will look up the recent articles on the conversion of car dynamos and their rewinding for other voltages, he may find a specification already given which suits his dimensions and required output.

3964. Cutting Gears for Single-compound Train.—G. J. A. S. (Street).

Q.—Will you please tell me if the sizes I have worked out for the gears shown on diagram herewith are correct? Also, what would be the ratio between A and B? Would cutter No. 4 — 6 P, 26 — 34 T, D + *f*, 360″, which I have, do to cut them?

A.—This is a single compound train, having equal ratio simple elements, and, as the pitch of both simple elements is the same, the first and last wheels can be mounted coaxially, exactly as in the case of the ordinary double gear of a back-geared lathe. It is composed of two simple gears of 16 to 23, and

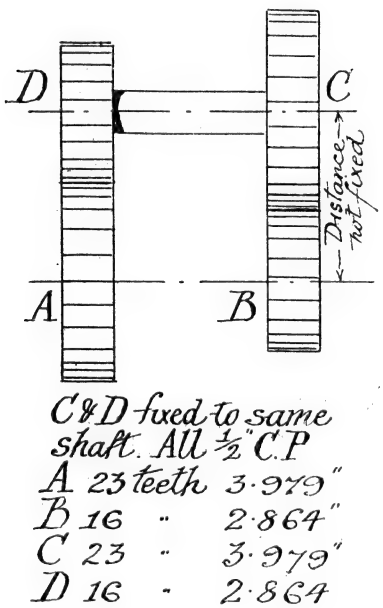


Diagram of Querist's Train.

therefore the ratio of the whole compounding is $\frac{16 \times 16}{23 \times 23} = \frac{256}{529} = \frac{1}{2.0664+}$ or, in round figures, 1 to 2 1/16 + 4/1,000, up or down, according to whether A or B is the first driver. B would be first in the case of a lathe, but the total ratio is too small for any lathe. The querist does not state what he has worked out, so we are forced to assume that he means the figures given to be the pitch diameter. If so, they are incorrect for ½-in. circular pitch. For 16 they should be as follows: 16 × ½-in. pitch = 8 ins. circumference of pitch circle, and $\frac{8}{\pi} = \frac{8}{3.1416} = 2.546+$ (+ on the end means that the decimal goes on) is the diameter of pitch circle in inches. The circumference of pitch circle of the 23 wheel is 11.5 ins., and $\frac{11.5}{3.1416} = 3.660+$. The first is 2 35/64th very nearly, and the second 3 21/32nd a little full. The 6 D.P. cutter described will not cut ½-in. circular pitch. The corresponding circular pitch of a 6 D.P. gear is .524 in. or 24 " thou." more. When cutting on a ½-in. pitch diameter it will leave a tooth 48 " thou." thinner than the tooth space, measured at the pitch circle. This will cause the gear to keep catching up, and show interference of running per tooth in the driven wheel. The gear *would* mesh, however. No. 4 cutter at a pinch might cut 23 and give a running gear, it really requires No. 5 cutter, but it certainly will not cut 16, which requires No. 7 cutter and a much more splayed tooth space at the points of the teeth. It is possible to " fake " cutting to give pinion tooth spaces with higher numbered cutters (numbers of teeth), but it requires the knowledge and practice of an experienced gear cutter, and cannot be described here, neither can it be recommended to a novice.

If correct cutters be used of 6 D.P. for this job the following will be the gear particulars:—

$$\text{P.D. } 16 = \frac{16}{6} = 2\tfrac{2}{3} \text{ ins.}$$

$$\text{P.D. } 23 = \frac{23}{6} = 3 \text{ 5/6th ins.}$$

$$\text{Blank D } 16 = \frac{16 + 2}{6} = 3 \text{ ins.}$$

$$\text{Blank D } 23 = \frac{23 + 2}{6} = 4 \text{ 1/6th ins.}$$

$$\text{Gear centres} = \frac{2\frac{2}{3} + 3 \text{ 5/6th}}{2} = \frac{6\frac{1}{2}}{2} = 3\tfrac{1}{4} \text{ ins.}$$

Total depth of tooth = working depth ⅓ in. plus clearance, or D + *f* = .360 in. as given.

3923. Making an A.C. to D.C. Converter.—T. F. (Bradford).

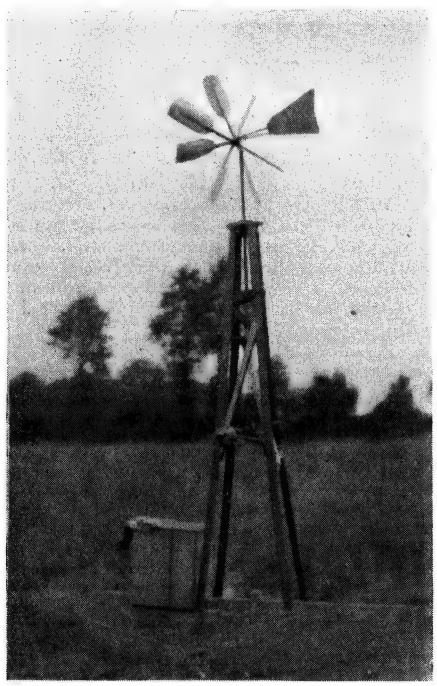
Q.—Can you tell me the correct windings for the machine sketched in the accompanying drawing to work as an A.C. to D.C. converter. It could be run either from the 230-volt 50-cycle mains or from a 3-volt transformed circuit.

A.—The sketch referred to shows a cast-iron field magnet of the two-pole design, excited by a single field coil, a cast-iron shuttle-type armature with a two-part commutator. The armature is 1.3 in. diameter by 1.35 in. long, the field magnet being in proportion, and the idea involved is to utilise this as a rotary rectifier by providing two slip-rings on the armature, an independent field winding and a double-pole double-throw switch. It is intended first to run up the machine as a shunt motor direct from the A.C. supply, and when synchronous speed of 3,000 r.p.m. has been reached, to throw the switch over so that the armature alone is fed from A.C. through the slip-rings, and the field excited from the same current rectifier by the two-part commutator; and in addition to take a D.C. output from the same source. While quite sound in theory, this device would never work satisfactorily in practice. For one thing, it is an altogether too small a scale. The machine could never be wound to run direct from a 230-volt A.C. supply. Even on 3 volts it would be scarcely more practicable as the D.C. output would be reduced to a theoretical $\frac{1}{\sqrt{2}}$, or 0.707 times the A.C. output at the commutator, which is again susceptible to further C.R. losses and armature reaction drop, leaving a uselessly low voltage for any practical purpose. As to the starting method proposed, shunt fields are useless; it would have to be series wound to run from A.C. as a commutator motor at all, and a series field would be unsuitable when the switch was thrown over for D.C. output. Even if a series field were provided for starting and a shunt field for running self-excited, the chances of changing over at exactly synchronous speed so that the machine falls into step are very remote indeed. In fact, there are so many objections that the proposal is not likely to meet with any success except as an interesting experiment.

PRACTICAL LETTERS from OUR READERS

A Novel Small Windmill. Model Car Racing.

DEAR SIR,—I enclose a photo of an interesting small windmill I discovered. I do not know who the constructor may be, but it is a very ingenious contrivance. The wheel, about 3 ft. diameter, of metal, sails on wood arms, is mounted on a motor-car speedometer gearbox of the swivelling type as used to take a drive from one of the front wheels; this allows the wheel to be turned into the wind. The gearbox is fixed into the end of a piece of gas-pipe, which is fixed to the wooden tower. Running inside the pipe is a vertical shaft of thick fencing wire, with a short piece of the same lashed to it near its lower end; this piece and the end of the shaft are bent to form a "Y," the arms of which engage with the spokes of the large wheel of a small hand-drill, fixed on a platform halfway up the tower. The chuck of the drill is closed on the spindle of a motor-cycle dynamo. The box by the side of the mill I expect is the accumulator house. There has been some good contriving here, but I wonder if the results repay the work put in.



Who Built It?
A small wind-driven generating plant, with some ingenious features.

Model Motor-Car Racing.

I should like to make a few remarks on the subject, raised a few weeks ago, of model car racing. A Model Automobile Club, as a writer in a metal trade journal remarked a short while ago, is the logical companion of the model aero, railway, yacht and other clubs already in existence. I doubt however, whether model car races could be successfully run except over very short straight courses, owing to the difficulty of steering the cars, and I expect that there would have to be a series of timed runs, perhaps round a pole, as with the hydroplanes; but the question is, would the sight of one car going round and round the track by itself be particularly interesting? If the cars could be made to tow their drivers, as model locos do, on trucks, or possibly on bicycles, there could be real races. But then why not fit your model engines into full-size cycle frames, and so start a "model" class (30 c.c.) motor-cycle, with a regular official list of record speeds for the kilometre, mile, etc., etc., etc., just as the larger classes have? That would allow of as much racing and as much experimenting with engines as any way, and though perhaps hardly *model* engineering, it would most certainly be *small power* engineering. I am afraid that it would be asking too much of the engines to expect them to drive more than a light bicycle, or else you could have very light cars just large enough for one man, run on bicycle wheels. But I think that I have said quite enough.—Yours sincerely,

F. P. NEWLEY.

A Model Marine Fuel Problem.

DEAR SIR,—In reply to Captain R. Gordon Berry's letter in November 20 issue of THE MODEL ENGINEER *re* re-filling the oil fuel tank in his model steamer: I successfully overcame this difficulty on my 1-in. scale N.E.R. Atlantic loco by using *two* tanks, which are both coupled to the burner by means of a standard 3/16th-in. three-way cock. The air pump in conjunction with the pressure-gauge is also coupled to both tanks by another ⅛-in. three-way cock. It is so arranged that whichever tank is being pumped up is also in connection with the pressure-gauge. This arrangement has never given any trouble on the loco, and the burner can be switched over to either tank without affecting the burner in the least, and, of course, it is quite simple to refill one tank while the other is supplying the burner. This idea was fully described and illustrated in the issue of THE MODEL ENGINEER for August 3, 1911.—Yours sincerely,

T. W. AVERILL.

Steam Distribution in Models.

DEAR SIR,—The discussion on "Late Cut-offs" has been very interesting, and perhaps a little escape from the safety-valve by Uncle Jim may not be amiss.

In my opinion the "valve" is the heart of the steam engine, and therefore the valve setting is a matter of the greatest importance.

Mr. G. J. Churchward, the late chief mechanical engineer of the Great Western Railway, once remarked that it took him twenty years to master valve gears and valve setting, etc. The outcome of his experience has been the universal adoption of the long travel piston valve with its early exhaust and early cut-off.

In designing and setting up a valve, the first point the model engineer should keep in mind is that of getting rid of the steam in the cylinder. It is quite an easy matter for the steam to flow into a cylinder but more important to provide for a rapid exhaust of the steam after it has done its work in that cylinder.

To accomplish this I invariably avoid lap on the exhaust side of the valve.

This permits the steam to exhaust before reaching the end of the stroke.

Similarly, steam should just be admitted to the cylinder on dead centre, for as soon as the piston moves, this will enable a full port opening early in the stroke.

Such a setting acts in a similar manner as advancing the spark in a petrol gas engine.

I entirely agree with that "Churchward of the model locomotive," viz., "L.B.S.C.," that a late cut-off in model valve gears is a mistake. An early steam opening and an early exhaust will render a model full of life and vigour as compared with the sluggishness caused by late admission and late exhaust.—Yours faithfully,

JAMES C. CREBBIN.

Re "Are Carburettors Necessary?"

DEAR SIR,—I read with interest the remarks of your excellent contributor, Mr. Westbury, in the issue of November 20, concerning the above subject, and whilst giving way to his undoubted knowledge of, and experience with carburation problems, yet reading between the lines appears (to me) the suggestion, "Don't bother with that experiment, you'll do no good."

My sole object in writing the article referred to was to pass on a "wrinkle" to those owning a model I.C. engine, minus the usual carburettor, who were, like myself, desirous of "seeing the wheels go round" without going to the expense of fitting one, the price of which cannot always be readily spared from the average working man's purse.

I may say that I have since tried the "carb.-less" dodge on a much larger engine with excellent success, and the idea has as yet not let me down, even with a "sceptical friend" present. If our friend Mr. Westbury is correct in his terminology, then we must class half a bottle-full of petrol stood on the workshop shelf as a carburettor, as that, in effect, is all that my engines work on, with the exception that the bottle in this case consists of a metallic tank with a pipe attached, nothing more. I fancy Mr. Westbury has got the idea that I use wick or some other absorbent; I hasten to say that there is absolutely nothing except as stated in my previous letter published a few weeks ago.

May I add in conclusion that the system under discussion does all that Mr. Westbury says is expected of a carburettor, the engine will accelerate immediately from a mere "tick-over" to an extraordinary high speed, the power being such that a rag gripped round pulley on the crankshaft will set fire in very short time.

Mr. Westbury is quite correct in his surmise as to my age; my memory only takes me back to the time when motor-cycles were fired by coil-ignition, on one of which (motor-cycle, not coil!) I once had the pleasure (?) of riding.—Yours faithfully,

A. E. WILLIAMSON.

A Point for Discussion.

SIR,—Given a horizontal double-acting slide-valve cylinder, which is the back cover?—Yours, etc.,

W. W. MASON.

Institutions and Societies.

The Society of Model and Experimental Engineers.

MEETINGS.—At Caxton Hall, Westminster, at 7 p.m. Tuesday, December 16, Annual General Meeting. No visitors allowed on this evening. Tuesday, January 6, 1931, Competition, Track and Model Night.

WORKSHOP.—The second demonstration on lathe work will be given at the workshop on Friday, December 19. This will deal with work between centres. These demonstrations deal with elementary work, and should be of assistance to the considerable number of new members who have expressed their need for some assistance of this kind. At the same time there are always wrinkles and tips to be picked up by those who may justly claim to be more advanced.

SUBSCRIPTIONS.—Those members who have not yet paid their subscriptions are reminded that they should send them to Mr. Lamb, the Treasurer, not to the Secretary.

A ticket of admission to one of the Society's meetings, and/or a ticket to view the workshop (not to attend a demonstration), may be obtained on application to the Secretary, R. W. WRIGHT, 202, Lavender Hill, Enfield, Middlesex.

Bolton Society of Model Engineers.

NEXT MEETING.—December 10, at 8 o'clock, in the Y.M.C.A. Institute, Deansgate. Will members please note that this will be the last meeting for the Old Year, and on this account we ask all members to make a special effort to attend.

Hon. Secretary, A. TAYLOR, 120, Chorley New Road, Bolton.

Leicester Model Engineering Society.

NEXT MEETING.—Thursday, December 4, at 8 p.m., at Mr. Mitchell's workshop, 59, Norfolk Street, Hinckley Road. Members are asked to bring any model along whether finished or not; also your difficulties—there is sure to be someone who can help you.

Secretary, J. H. RILEY, "Earlsdon," Scraptoft Road, Leicester.

The Victoria Model Steamboat Club.

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The Annual General Meeting will take place at the Boathouse, Victoria Park, on Sunday, December 21, at 11.30 a.m. sharp. As we understand the Treasurer (Mr. E. Godfrey) and the Hon. Secretary (Mr. W. Poole) will hand in their resignations on this occasion, we hope all members will make a special effort to be present and take part in the proceedings.

Hon. Secretary, WM. POOLE, 396, Old Ford Road, Bow, E.3.

Notice.

The Editor invites correspondence and original contributions on all small power engineering, motor and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. It should be distinctly stated, when sending contributions, whether remuneration is expected, or not, and all MSS. should be accompanied by a stamped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

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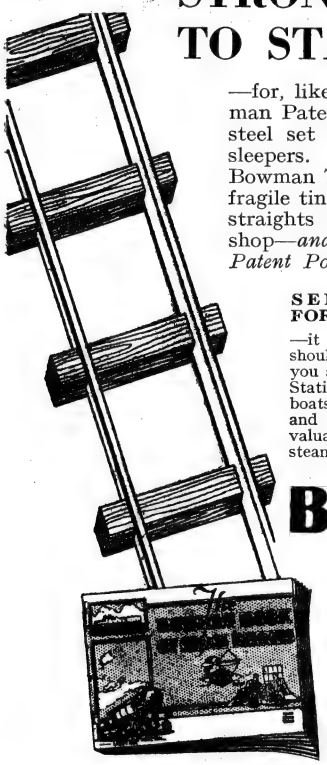

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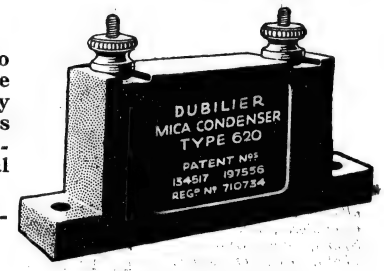

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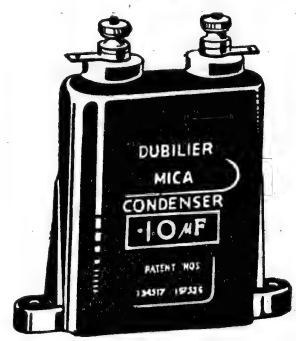

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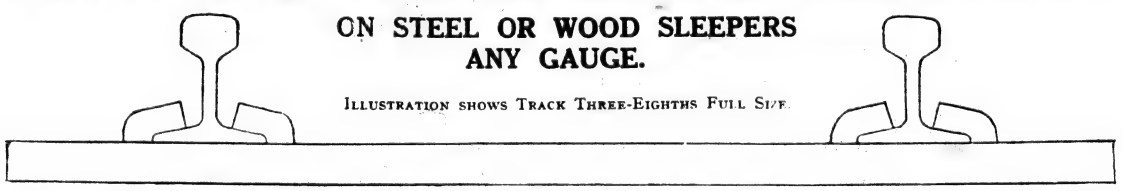

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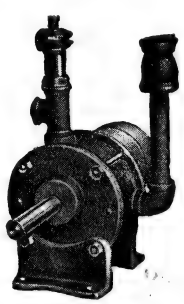

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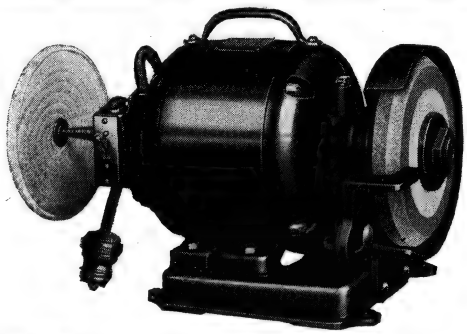

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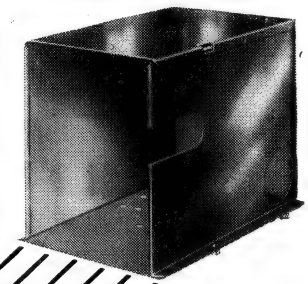

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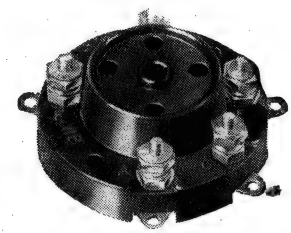

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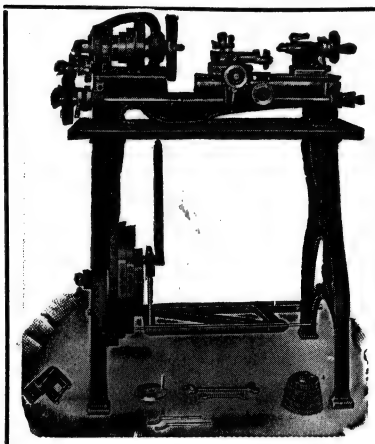

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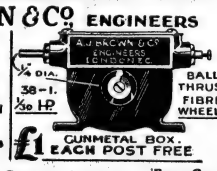

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More Clearance Bargains.—Genuine ex-Government surplus. Milling Cutters, etc., H.S.S., 6 samples 6s.; best Fluted Taps, sample 30, assorted, 6s.; Plated Hood Snap Fasteners, 3 dozen sets, 1s.; 50 Assorted Valve Springs, 2s. 6d.; Leather Washers for oil and petrol joints, 100 1s.; Spring Washers, 1s. gross, assorted to ⅝"; Mica Washers, 3d. gross; Flat Steel Washers, 2s. gross; Assorted Fibre Washers, 1s. 6d. gross; Buzzers, with platinum points, 1s. each; Super Microphones, 1s. each; Round-nose Pliers, 3d. each; Compression Taps, 10d. dozen; Terry Valve Removers, 4d. each; Magneto aud Carburettor Spanner, 2d.; Magneto Carbons, assorted 3 dozen, 3s. 6d.; Magneto Screws, assorted, 3s. gross; Spring Posts, 3s. dozen, assorted; 100 new Magneto Parts, assorted, 7s. 6d., worth pounds; Magneto Armatures, with condenser, 1s. each; ditto, tested, 4s. each; adaptable for M.L., Bosch, B.T.H., etc.; ditto, C.A.V., with slip-ring, 7s. 6d.; C.A.V. Brush Holders, 1s. 3d. each; Magneto Reamers, 4 mm. and 5 mm., 6d. each; Distributor Insulated Terminals, 2s. dozen; slightly soiled Keyway Cutter Bars, 1s. each; Taper Reamers, jobbing, 5/16", 7/16" and ½", 2s. set; ditto, 19/32", 1s. each; Lodge Plugs, in boxes, 3s. 6d. dozen; postage extra.—Below.

Bright Steel Bolts, Nuts, etc., 15s. cwt.; sample 10 lbs., 3s. 6d., post free; 2 B.A. and 4 B.A. Steel Bolts, 3 gross assorted, 3s. 6d., post free.—MARCHANT, Tiptree, Essex.

Pulleys, Shafting, Plummer Blocks, Hangers, Gear Wheels, Belting.—SWINNOW ENGINEERING Co., LTD., Bramley, Leeds.

Silver Solder Your Steam Pipes. Sufficient for 24 joints, with flux and instructions, 1s. 6d.; double quantity, 2s. 6d. Accurate Turning. Moderate prices.—HOLE, Engineer, Ryde.

Don't Scrap that Old Leaky Kettle, Pot, Pan, leaking Pipe. Make it like new with Valetta Metallic Cement. It welds without heat. Withstands fire and water. Sets like steel.—Post 1s. now to F. S. IKIN, Weston, Shrewsbury.

Balsa! Balsa! Balsa! The ideal wood for modellists. All grades and sections.—R. S. S., 171, New Kent Road, S.E.1.

New Wheels Cut from old patterns or sketches only. Any tooth, diameter or material. Quotations, stamp. Also Invar Pendulum Steel (non-magnetic) supplied. Watch, Clock, Jewellery materials and repairs a speciality.—YOUNG & SON, "M.E." Material Dealers, Chippenham, Wilts.

Bargain.—Costly Complete Service Stainless Cutlery, beautiful things, knives, forks, spoons, etc., not canteen rubbish, unused traveller's samples, 70 pieces, 49s.; particulars, approval.—J. HENRY, 225, Belvedere Road, Burton-on-Trent.

Casting Moulds for Lead Soldiers, Farmyard Animals, etc. Catalogue, stamp.—INDUSTRIES, 13, Gordon Avenue, Twickenham.

"Wood Toymaking." A practical handbook, with 180 illustrations of effective toys; 1s. 6d. posted.—INDUSTRIES (below).

Dolls' House Brickpaper, roof, flooring, bedroom, kitchen and fancy papers. Complete set, six sheets, 1s. 6d.—INDUSTRIES, 13, Gordon Avenue, Twickenham.

B.S.A. Air Rifle, 4-guinea model, new last year, guaranteed deadly accurate, £3 or offer.—Below.

Professionally-made Flanged Riveted 15"×6" Steel Vertical Water-tube Boiler, sight and mud-holes, screwed bosses for fittings, 65 lb. pressure, as new, £3 or offer.—LAWRENCE, Scotney Street, Peterborough.

Springs for the Model Maker and Engineer, 1s. 3d. and 2s. 6d. per box, from 1/16" diam. to ½"; Spring Belting, in 6-ft. lengths, with fasteners, 1/10" diam. 1s., ⅛" 1s. 3d., 3/16" 1s. 6d., ¼" 1s. 8d.; Springs for the auto. trade. Prices per return.—LITCHFIELD BROS., Broadholme, Belper.

Solid-drawn Copper Tubes, in 2-ft. lengths, ½" bore×18 g., 1s. 3d.; ¾" bore×18 g., 1s. 9d.; 1" bore×17 g., 2s. 6d.; 1½" bore×17 g., 3s.; all per length.—4, Church Lane, Battersea, S.W.11.

Engineer's Workshop for Sale or To Let. Lathes drilling machines, grinder, etc. Low rental. Electric light and power. Walthamstow district. Suit anyone starting small business.—MARTIN, 34, College Road, Leyton. (Walthamstow 1871.)

Sale.—Electric Converter, 15s. 6d.; Binks 3-jet Carburettor, 10s.; Typewriter, 15s.; Motor Cycle Headlamp, with twin generator, 6s.; Motor Cycle Saddle, also Pillion Seat, 8s. 6d.; two Brass Car Oil Side Lamps, 7s. 6d.; 6 Vols. "Artizan," 6s.; 4 Vols. "Science Siftings," 4s.; Set Chessmen, 6s.; all good; stamp, reply.—13, Hunter Street, Mountfields, Shrewsbury.

A New Line for Experiment.—Sale, two Phillips latest type 3511 Photo Electric Cells, suitable for "Talkies," etc., brand new, cost £4 10s. each, would accept £5 for the two.—LOCKEY, Alma House, Patrington, E. Yorks.

Rotax Charging Dynamo, 12 volts 8 amps., 25s.; Resistances, with tappings, take 2 amps., 1s. 6d. each; K.L.G. F.7 Plugs, in makers' boxes, 1s. 6d.; ditto, long reach, 2s.; Silver Steel, 8 lb. assorted rounds, ⅛" to 7/16", 9s.; 6 lb. Gauge Sizes, 51 to ¼", 7s.; ½", 9d.; ¾", 1s. 9d.; 3 lbs. Assorted Squares, ⅛" to ½", 4s.; Bright Mild Steel Rounds, 4d. lb.; Hexagons, Squares, Flats, 6d. lb.; Nickel Steel Rounds, thick Steel Tubing, Brass Rods and Plates, at low prices; 5-pint Brazing Lamp, £1; Centrifugal Blower, 3" delivery, £2 15s. Clearing out Tools, etc. Send your inquiries.—BURNETT, Carronside, Stonehaven.

Materials, Tools.—Solid-drawn Steel Tube, ½"—3"; Hightensile Steel, round, flat and square sections; any length or size at half mild steel prices. A few parcels up to 1 ft. at 7s. 6d. 28 lb. State requirements.—Below.

Adjustable Spanner, 4" or 6", pair Pliers, 10" Screwdriver, 6" Screwdriver, 4 tools 1s. 6d., slightly used; Hammers, Files, Drills, Chisels, equally cheap.—SHEPHERD, Mason Road, Cippenham, Bucks.

Brass Rods, Tubes, Gear Wheels, Blanks; lowest prices; large stocks; prompt delivery.—Below.

Castings, Tubes and all Materials to build 6"×3½" Vertical Tubular Boiler, 12s. 6d., post free. Blue Print, 6d., allowed off order for materials.—BLEASDALE, 6, Haynes Road, Gidea Park, Essex.

Sun Bathing at Home for £5. Complete £12 12s. Doctor's Sun Lamp, with full instructions. Anyone can use it. Improves health, complexion, vitality, indigestion and rapidly gives you new life and colour. Complete and perfect, £5. Exactly as used by doctors, hospitals and private people everywhere. Stamp, please.—"Lido," Rigdeview Road, N.20.

Steam Pressure Gauges, 0—60, 1⅜" diam. brass cases, 3s. each.—BOULDSTRIDGE, 84, Purrett Road, Plumstead, S.E.18.

Staggering Value Really. £3 17s. 6d. Here's an ideal installation, comprising 6 to 10-volt Modern 8-amp. Enclosed-type Ball-bearing Shunt-wound Dynamo, with slide rails and driving pulley, also Switchboard, with first-class ampere meter, main switch, double fuses, and automatic magnetic charging cut-out, and also Heavy 6-volt 80-amp. Lighting Accumulator, by Exide Co.—UNIVERSAL MOTORS, James Road, Derby.

"Iron-Steel-Cement" (copyright). Repairs castings, ovens, boilers; 9d., 1s. 3d., 2s. 6d., 4s. 6d., 6s. 9d.; posted.—ALBERT FEATHER, White Abbey Road, Bradford, Yorkshire.

"Let Me Explain," by Archibald Williams. Most of us do not know how to explain! Try to "explain" a motor bicycle, or just your own ordinary electric light. The author has the gift of explanation, and deals with Aeroplanes, Big Guns, Cold Storage, Dredgers, Electric Motors, Escalators, Flour Mills, the Kinematograph, Mechanical Typesetting, Motor Cars, Paper-making, Snow Ploughs, Steam Engines, Steel Manufacture, Wireless Telegraphy, Wireless Telephony, Water Supply, and Wood-cutting Machinery. Just the book for the fireside! Price 8s. 3d. post free from PERCIVAL MARSHALL & Co., LTD., 66, Farringdon Street, London, E.C.4.

"General"—(*Contd.*)

A New Britannia 4½" Screw-cutting Treadle or Power Lathe and ten 20s. prizes given free to customers. With each 1s. you spend to January 3 next you will receive a free coupon for a simple competition where everyone has an equal chance of winning. We will send the lathe, carriage paid, to winner's address. Result in *M.E.*, January 15. The Editor holds value of lathe and sealed solution, and will open on January 2, 1931.—H. BROOK & SONS, Poulton-le-Fylde.

1s. Any Lot, post free :—
1 doz. Any Size Twist Drills, numbers 30 to 60.
6 Any Size Twist Drills, numbers 1 to 29.
4 Best Twist Drills, about ¼" to ⅜".
20 Best Twist Drills, 1/16" and under.
6 High-speed Twist Drills, to 3/16".
12 Left Hand Twist Drills, 3/16" and under.
8 Different Sizes Straight Flute Drills to 5/32", 3/16" or ¼", best for brass.
6 Tapping Drills for any B.A. sizes.
3 Different Sizes Centre Drills.
Three small Carborundum Wheels, assorted.
1,000 Aircraft Rivets, assorted, for model work.
250 Model-makers' Copper Rivets, assorted.
144 B.A. Steel Screws, assorted.
One Gross 2, 4 or 6 B.A. Nuts, or assorted.
200 Screws, Nuts and Washers, best assortment.
250 Whit. and B.A. Screws and Nuts, assorted.
One 4" or 6" Chesterman Steel Rule.
Any Right Hand Die and Tap, 2, 4, 6, 10 B.A., ⅛", 3/16", ¼", 5/16" Whit.
One Millimetre Die and two Taps, 3 or 4.
Any Left Hand Die and Tap, ¼", 9/32", 5/16" B.S.F.
Two Parallel Reamers, ⅛", 5/32" or ¼".
Two ¾" diam. ¼" bore Ball Races.
¾"×¼" Ball Race, housed in 3" aluminium grooved pulley.
Two Small Straight Shank End Mills.
Three Small Assorted Slot Cutters.
72 Well-assorted Terry's Springs.
One Crucible, 7 lb. capacity.
Any 8 Lots, 7s., with Engineer's Chart given free.

2s. Any Lot post free.
Two each Taper and Parallel Reamers.
Two Ball Races, ⅛"×1⅛" or ⅜"×1⅜".
50 ft. 3/32" Genuine Aero Control Cable.
1½ lb. Phosphor-bronze Rod, 1 3/32" diam.
One Steel 4" Try Square, good make.
One doz. Assorted Best Twist Drills to ⅜".
1 Each Cleveland Twist Drills, 7/16" and ½".
1 Die Stock, 1" or 1¼".
Emery Wheel Dresser, complete with cutters.
10" Circular Saw for wood.
2 lb. Assorted Silver Steel, good sizes.
8 Best Quality Assorted Small Files.
6 Whit. or B.S.F. Taps, assorted.
4 Whit. Circular Dies, ¼" to 5/16".
4 lb. Assorted Whit., B.S.F. and B.A. Metal Thread Screws and Nuts for model work.

5s. Any Lot, post free :—
Tool-bag with 6 Tools, for motor mechanic.
Tool-box with 6 Tools, for model engineer.
Tool-box with 6 Tools, for woodworker.
Plug and Ring Gauge, any ¼" to ⅞".
1,000 Bright Steel Bolts, Nuts and Washers, handy lengths to ¼" thick.—H. BROOKS & SONS, Poulton-le-Fylde.

Photographs of "dear old London." We hold a stock of real bromide photograph post cards of British manufacture, in two sets, each containing 12 views of well-known sights; price 2s. 2d. per set, post free. Why not send a set to your friend overseas—your thought will be appreciated.—Below.

London Post Cards Set No. 1 shows Tower of London, Tower Bridge, View from the Monument, London Bridge, Law Courts, Thames Embankment, Nelson's Column, Trafalgar Square, "Big Ben," and County Hall, Piccadilly Circus, Constitution Hill and the Quadriga, and Changing the Guard at Buckingham Palace. Price 2s. 2d., post free.—Below.

London Post Cards Set No. 2 shows Hyde Park Corner, Piccadilly and Green Park, St. James' Palace, Changing the Guard at Horse Guards, Westminster Bridge and Houses of Parliament, Trafalgar Square, Gaiety Theatre and the Strand, Australia House and Aldwych, Bank and Royal Exchange, Tower of London, Tower Bridge, and the Pool of London. Price 2s. 2d., post free. Mention number of set when ordering, please.—PERCIVAL MARSHALL & CO., LTD., 66, Farringdon Street, London, E.C.4.

Jig-Saw Puzzle for the young railwayman. A facsimile reproduction in colour photography of the famous Loco "Royal Scot," reproduced in fullest detail; 160 pieces, full size 22½"×10". Price 5s. 6d., post free.—PERCIVAL MARSHALL AND CO., LTD., 66, Farringdon Street, London, E.C.4.

Splendid Coloured Plates of Locomotives are now ready: "King George V," price 1s. 2d., post free; "Royal Scot," 1s. 2d., post free; "King Arthur," 1s., post free. Sent by return post.—PERCIVAL MARSHALL & CO., LTD., 66, Farringdon Street, London, E.C.4.

Home Cinematography.

Cinematograph Films and cheap British-made Machines, Accessories; list free.—"FILMERIES," 57, Lancaster Road, Leytonstone, London.

Standard Cinema Films. Electric Cinemas cheap. Lists free.—"FILMS," 109, Kenlor, Tooting.

What About a Spotlight for your concert or dance? Complete Stage Lime, with arc, 30s.—NEWLAND, c/o Nilsen & Co., 5, Nevada Street, Greenwich.

Home Cinema Machines and Films for Christmas. Lists free.—RAMAGES, 18, Fouberts Place, W.1.

Films for Sale. Send 3s. for sample; 800 to 1,000 ft. long; in good condition; carriage paid.—O. CRESSWELL, 106, Runnymede Road, Hall Green, Birmingham.

Films of Every Description from 5s.—BAERS, 176, Wardour Street, W.1. Est. 1907. We buy, sell and exchange.

Quick Sale.—Films, new condition, 35 mm., 3,000 ft., 15s.; Professional Cinematograph Mechanism, 37s.; Stand, 12s.—A. MUNDAY, Pinden, Dartford.

Boilers in Steel or Copper, all types and sizes; Locomotive Boilers from ½" scale made to fit your frames, flanged plates; supplied copper or steel.—GOODHAND, Marlborough Road, Gillingham, Kent.

Buy British Boats for British Boys.—30" Torpedo Boat Destroyer, electrically or clockwork driven, beautifully finished and guaranteed, price 45s.—Below.

30" Liner, Cargo Boat and Destroyer Hulls, fitted stern tube. propellor, decked, and painted grey, price 15s. 6d. each.—Below.

3-ft. and 39" Liner and Destroyer Hulls, 25s. and 30s. Any type and size of hull made to order.—Below.

Marine Steam Plant, double-acting piston valve engine, ½" bore, ½" stroke, brazed brass boiler fitted with steam valve, safety valve and spirit lamp, price 18s. 6d.—Below.

Send 3d. for Illustrated List, with full particulars.—Manufacturers: G. H. FOULKES & W. A. EDWARDS, Sutton-Weaver, Warrington.

Passenger-hauling Locomotives, 1" scale and upwards; Garden Railways complete.—PARVER MODELS, Virginia Street, Southport.

Double-acting Oscillating Engine Castings, ⅝" bore, ¾" stroke, gun-metal, with blue print, 3s., post free; first-class Horizontal Slide-valve Engine Castings, ⅞" bore, 1¼" stroke, with blue print, 10s. 6d., post free. Send stamped envelope for list of castings to this engine. Any faulty castings replaced free.—J. CALVERT, Model Engineer and Pattern-maker, 5, Field Place, Marston Road, Stafford.

2½-in. Gauge G.N.R. 8-ft. Single Loco., requires completing, fire and water-tube boiler, link reverse motion; tender nearly finished; £5, quick sale.—Apply 154, Woking Road, Guildford.

20,000 Hornby Meccano Railway Lines, Gauge 0, straights and curves, 1s. 6d. dozen, carr. paid. Special terms for quantities.—NORTHERN EMBROIDERY, Gorton Street, Blackpool.

Highly-finished Beam Steam Engine, 2½" by 1 3-16" cylinder, good working order; price £5, or nearest offer.—STONE, Llanyford, Upper Dovercourt.

B.B. Engine, 25s.; S.50 Engine, 40s., made by Stuart's; offers, exchanges.—SWIFT, 7, Mornington Rise, Matlock.

Model Yacht "Vera," planked hull, 4 ft. 3 in. long, rigged, beautifully made; offers, appointment.—MONK, Lyndhurst, Bourne End, Bucks.

Model Liner Hull, 67"×8½" beam; professionally built, but not quite finished; cruiser stern, twin screws and gear-box; B.-L. 6" centre flue boiler to fit, complete with fittings. Reasonable offers.—D. BUCKHAM, Kenwood, Sheffield.

Sale, Exchange.—Twelve-Wheeled Loco, tank. clockwork, five wagons, guard's van, rails, points, crossings, etc., etc.; O gauge; new condition, 40s.—EMMERSON, 3, Crossland Road, Thornton Heath.

Power Boat Plant, centre-flue, cross tube, superheater boiler, steams at 150 lbs. pressure; complete with all fittings, with high-speed engine, auto lubrication, all tubing, and speed propellor, £2. Professional job, as new.—111, Mapledene Road, Dalston, London, E.8.

Have You Sent for Our List of Steam Engines, Boilers, Sets of Castings, Accessories, etc., price 4d. (returned first order). Let us quote you for any model work or repetition machining. All estimates free.—CATES, Engineers, Low Row, Carlisle.

¾-in. Scale "Royal Scot" Locomotive, passenger hauling, coal-fired, engineer-built; splendid puller and in excellent condition; seen by appointment, or write for full particulars.—C.R., 83, Halford Road, Hillingdon, near Uxbridge, Middx.

Beam Engines, illustrated and described, MODEL ENGINEER, September 11. Fine scale model with brazed copper boiler, £7 10s.; smaller, £3 15s.—KERR, 37, Mayfield Road, Edinburgh.

0 Gauge Wooden Coaches, Wagons, Electric Loco, Stations, Signal Boxes, etc. Stamp, list.—B., 2, Willow Road, Aylesbury.

Aeroplane, flies 900 ft. and "stunts," 2s. 9d.; two, 5s.—BRISTOL MODEL AEROPLANE DEPOT, Eastville, Bristol.

"Dairymaid" Builders.—I can supply Wheels, Castings, and materials at reasonable prices.—A. J. CULHAM, 21, Strathmore Gardens, Romford, Essex.

Lowke's Gauge 1 Railway, Engines, Coaches, etc., practically new.—COOPER, 3, Harlesden Gardens, N.W.10.

Wet H.T. Batteries, easy to build, long life, constant output, self-charging. Parts per dozen: Jars, 2½×1½ square, 1s. 3d.; Zincs, 11d.; Sacs, 1s. 2d. doz.; dozen Cells (18 volts), complete with bands and electrolyte, 4s. 3d., post 9d.; Sample Unit, 6d. Illustrated booklet free. Wireless list free. Amplifiers, 19s.; Two-valve Sets, £4.—L. TAYLOR, 57, Studley Road, Stockwell, London.

"M.E. 1500." Three-valve Receiving Set. We have for sale two Demonstration Sets, built by the designer, and using the components mentioned in his descriptiive article in *M.E.*, February 13-27 last; these sets are complete with splendid oak cabinet (see photo in February 13 issue). May be inspected in our Publishing Department between 9 a.m. and 5.30 p.m. Price, minus valves and batteries, £10 each.—"M.E." WIRELESS, 66, Farringdon Street, London, E.C.4.

100-volt Exide Batteries, splendid condition, 20s.; 25-volt Charging Dynamo, 25s.; Douglas Combination, perfect, £4; bargains.—246, Thimblemill Road, Smethwick.

Buy a Moving Coil Loud-speaker and have real music. In polished oak cabinet 18"×16", cobalt steel permanent magnet, no current required. Price £4 10s., carriage paid. Money refunded in 7 days if not satisfied, or write for particulars from W. G. TURNER & SONS, Springfield, Langley, Maidstone, Kent.

Six-valve Super-Het., on chassis, less valves, etc., licensed under De Forest patents, £10, cost £40.—WICKS, 22, Bromley Hill, Kent.

Wonderful Offer.—Complete Modern One-valve Broadcast Receiver, receives British and foreign stations, for 10s., or C.O.D.—LABORATORY (3), Chesnut Road, Enfield, Middlesex.

The Morse Alphabet can be memorised in five minutes with the aid of the "Morse Alphabet Chart"; an utterly impossible feat by any other means! With a knowledge of Morse your instrument will render enormously added pleasure. Designed by G. Ready. Price 7½d., post free.—PERCIVAL MARSHALL & CO., LTD., 66, Farringdon Street, London, E.C.4.

Rear Cycle Plates, raised figures, painted cast aluminium, 3s. each, post paid.—HIRST, Bridge End Foundry, Brighouse, Yorkshire.

Dynamos.—Rotax, off Morgan, suit cycle, 14s. Simms, Ford, 10s. each; Battery, 12s. 6d.; Grease Gun ;offers.—Box 1531, MODEL ENGINEER Offices.

Exchange Four-cylinder 6 h.-p. F.N. Cycle Engine for 6 h.-p. Single Water-cooled, De Dion preferred.—FOLEY, Sandgate.

Carburettor, Brown-Barlow, 3s. 6d.; Single-cylinder Magneto, 10s.; Trembler Coil, 2s.; Horizontal 3 h.-p. Oil Engine, Bosch magneto, £4.—288, Sidcup Road, New Eltham.

Rover 3-speed Gear, sound, 10s.; four 28×3 Tyres, £1; good 3,000 miles; Lucas Twin Magneto, 180°, £1; Lucas Dynamo, 8 amp. 8 volts, perfect, £1; Cut-out and Ampere Meter, 10s.; Chemicals, Flasks, Burette, 10s. lot.—SHACKLE, Harlington, Hayes, Middlesex.

Motor Cycle Engine, Triumph 2½ h.-p., Bosch magneto, carburettor, excellent condition, 20s.; also Tank, 5s.; and Gear-box, 7s.—Box 1533, MODEL ENGINEER Offices.

LIGHT MACHINERY Sales and Wants

(*Continued from page* xvi).

Tools

Lathes.—Britannia, C. A.V.,Drummond, Edgar, Eta, Exe, Milnes, Patrick, Wade, and all leading makes in stock.—BUCK & RYAN, 310-312, Euston Road, London.

Lathes, standard makes, easy terms; lists free.—Machinery Dept., J. G. GRAVES, LTD., Sheffield.

Lucky Fellow! He bought a "Semco" Chuck and now has no regrets.—Below.

You Needn't Take Risks! In 1907 we started making Chucks for *M.E.* readers, and, having stood the test of time, we're still going strong. We supply most leading lathe makers. Chucks on approval against cash.—Below.

Independent Chucks, light model, having four reversible hardened steel jaws, square thread screws, specially designed to screw direct on to Drummond and other light lathes, saving overhang, and weight and expense of backplates. Price: 3" Chucks, 29s. 6d.; 3½", 29s. 6d.; 4½", 33s. 6d.; 6", 39s. 6d.; 7½", 50s.; screwed for lathe, 3s. 6d. extra.—Below.

Chucks! Chucks! Self-centring Chucks, Drill Chucks, Independent Chucks. All sizes up to 30" diam. 5,000 Chucks in stock! Write us before buying elsewhere.—Below.

Three-speed Treadle Motors, for driving all classes of light machinery. Price on ball bearings, 56s.; plain bearings, 46s.—STERLING CHUCK CO., Cobden Street, Bradford.

Lathes, Shaping, Drilling and Milling Machines, surplus small tools, new and unused.—WHEELER CO., LTD., Trench, Wellington, Shropshire.

Brownie 3½" Lathes, 25s.; Foot Treadles, 35s.; Compound Rests, 15s.; stamp, particulars.—BROWN BROS., Accrington.

Accurately Machined Slotted Angle-plates, 3" 1s. 6d., 4" 2s. 3d., 5½" 2s. 9d., 7½" 3s. 6d.; all delivered.—SMITH, Moorlands House, Mablethorpe.

Allball Treadle Grinder, 50% superior to any other. Consult your Merchants, or HEYDEN, Allball Works, Redruth.

Slide-rests. Full range taper turning.—KINGSTON, Rock-a-Nore Road, Hastings.

Genuine Goodell-Pratt Bench Drill, 2 speeds, auto feed, tee-slotted table, chuck 0—½", perfect, bargain 27s. 6d.—CARUS, 8, Redlam Brow, Blackburn.

3½" Drummond Lathe, complete with all accessories and countershaft, with pulleys for I.C. Motor (but no motor), and new Electric Motor, includes all tools, change wheels, and attachments for gear-cutting, etc., etc. To be sold at a reasonable price.—Apply, Box 1532, MODEL ENGINEER Offices.

One Patrick 4½"×2-ft. 3" Centre Back-gear S.C. Lathe, with treadle, tray and standards, change wheels, and 4" S.C. chuck, as new, ¾" hole in mandrel, £13 10s.; one Voltmeter, 120, brass, 4" dial, new, 12s. 6d.; one 3½" Parallel Bench Vice, 6s.—FEATONBY, Front Street, Haswell, Co. Durham.

Drummond 5½" Gap-bed Lathe, complete with 10" independent chuck, change wheels, face-plate, countershaft, and part of treadle gear, £16.—MICKLEBURGH BROS., 143, Walmer Road, London, W.10.

3¼" B.G. S.C. Lathe, gap bed, hollow mandrel, compound rest, 20" centres, flat belt, £7 10s.; Foot Motor to suit, 30s.—SUMMERS, 24, Watermead Road, Catford, S.E.

2⅜" Bench Lathe, complete with faceplate, chuck, compound rest, tee-rest and tools, £2; or exchange for Hartop Petrol Engine, W.C., magneto, ½—¾ h.-p., or Stuart.—RAINBOW, Coundon Hall Farm, Keresley, Coventry.

11 Machine-cut Wheels, 15 to 75 teeth, ⅝" bore, 8s.; strong Screw Punching Bear, with punch and die, to punch ½" iron, 8s.; number of Salter's Differential Pressure Gauges, 6" diam., to 50 lb., new, never been used, 8s. each; 10-ton Hydraulic Lifting Jack, by Tangye, 33s.; 24-ton, by Young, 35s.; both in perfect order; 1-ton Worm-geared Chain Block, 33s.; 1-ton Moore's Differential Chain Block, 33s.; both blocks are equal to new; ½-ton ditto, 28s.—GOODHAND, 7, Marlborough Road, Gillingham, Kent.

Extraordinary Bargains in Tools. Illustrated list free.—OWEN JONES, Beaumont Street, Liverpool.

Do You Desire to Improve or alter your lathe, etc.? Are you desirous of driving your workshop by motor or engine? Let us assist you with castings or parts.—WALTER BROS., 157 and 205, Ainsworth Road, Radcliffe, Manchester.

6" Centre S.S. & S.C. Lathe, by Drummond Bros., back-geared, 1" hollow spindle, 4-ft. gap bed, either treadle or for direct motor driven, faceplate, steady, change wheels; 4½" Centre Milne S.S. & S.C. Lathe, back-geared headstock, ⅝" hollow spindle, 4-ft. 6" gap bed, chucks, faceplates, steady, change wheels and countershaft. Large selection of Lathes by Lang, Dean, Smith and Grace, Archdale, etc.—JOHN CASHMORE, Great Bridge, Staffs.

Three-speed Flat Belt Treadle Motion, 30s.; 7" Bronze Dividing Plate, 7s. 6d.; extra heavy 14"×4½" Machined Slotted Angle-plate, 12s. 6d.; 3" Swivel-jawed Machine Vice, 7s. 6d.; Morse No. 1 Lathe Centres, 2s. 3d. pair; Milled Steel Vee Blocks, 2s. pair.—ALBERT SMITH, "Moorlands House," Mablethorpe.

Fully Compound Slide-rests for 4" Drummond's, 37s. 6d.; others to order; Vertical Milling Slides for 3" lathes from 20s.; 3" Centre Lathes from 55s.—BAILEY & Co., 53, Chester Park, Fishponds, Bristol.

Reamers, parallel and taper, all sizes, half maker's price.—GREEN, Westbury Lane, Buckhurst Hill, Essex.

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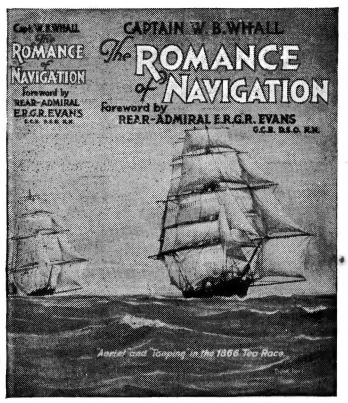

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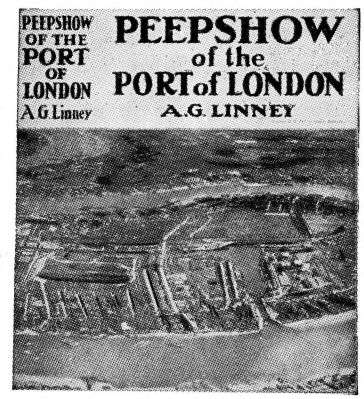

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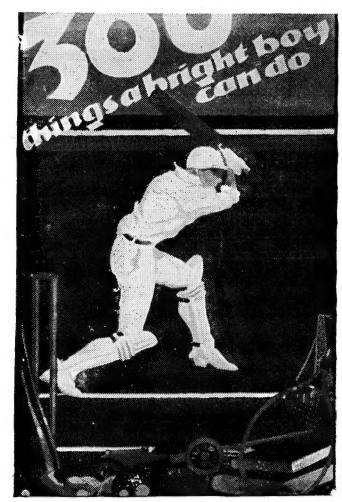

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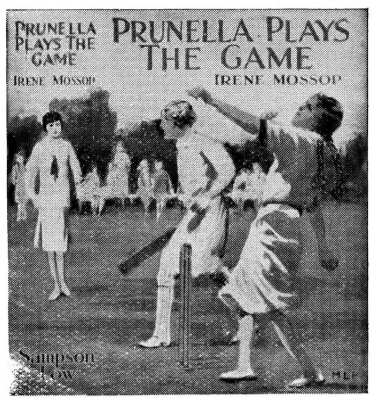

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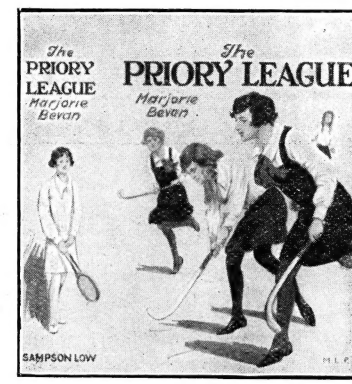

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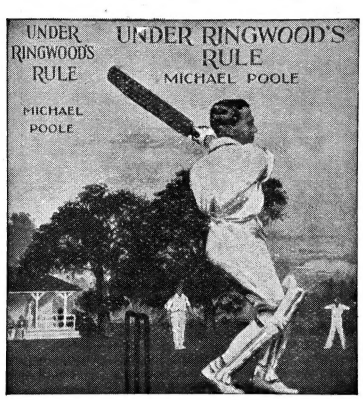

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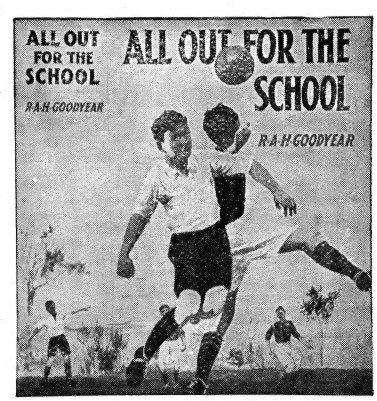

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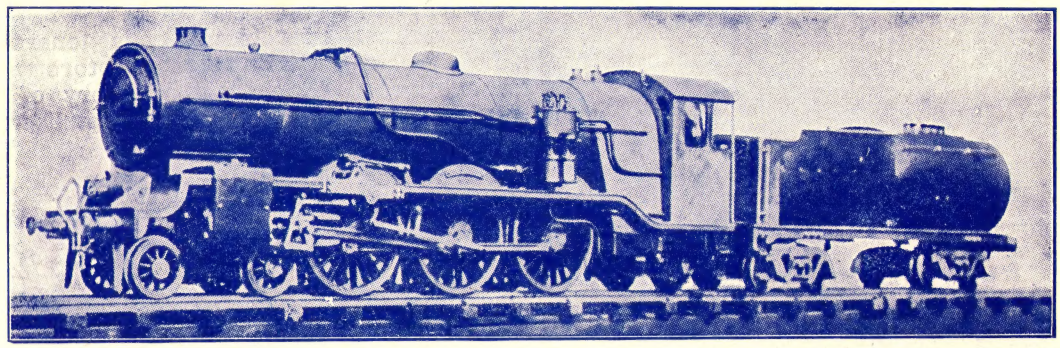

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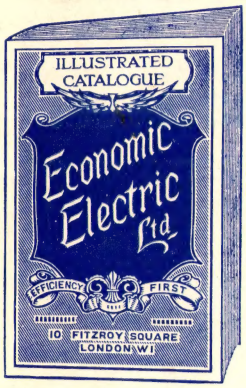

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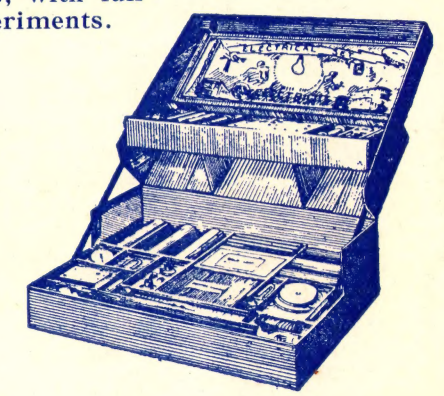

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LONDON: Printed for the Proprietors by LOXLEY BROS., LTD., 50, Southwark Bridge Road, S.E.1, and Published by PERCIVAL MARSHALL & CO., LTD., 66, Farringdon Street, E.C.4.